THE GEOGRAPHICAL JOURNAL

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Monday October 15 at 5.30 p.m.
NATURE RESERVES OF THE CONGO–NILE DIVIDE. *Colour films. Commentary by Tracy Philipps, Secretary-General of the International Union for the Protection of Nature.*

Monday October 22 at 8.30 p.m.
EXPEDITION TO GOUGH ISLAND. *By John Heaney and Martin Holdgate.*

Monday October 29 at 5 p.m.
PHYSIQUE OF WALES. *By E. H. Brown.*

Monday November 5 at 6 p.m. **(Please note time.)**
VOYAGE OF THE *SEVEN LITTLE SISTERS. Colour films with commentary by William Willis.*

Tuesday November 6 at 5 p.m.
TWENTY-FIVE YEARS OF MESOPOTAMIAN DISCOVERY. *By Prof. M. E. L. Mallowan, F.B.A.*
Anniversary lecture of the British School of Archaeology in 'Iraq, open to Fellows and Members of the Society.

Monday November 12 at 8.30 p.m.
OPERATION "DEEPFREEZE I." *By Lieutenant-Commander M. J. N. Foster, R.N.*
An account by the British liaison officer of this year's United States Antarctic Expedition.

Monday November 26 at 5 p.m.
EVOLUTION OF THE RELIEF OF THE CAM VALLEY. *By B. W. Sparks.*

Monday December 3 at 8.30 p.m.
MILITARY GEOGRAPHY OF WALES. *By General Sir James Marshall-Cornwall.*

Monday December 10 at 5.30 p.m.
TENZING'S COUNTRY AND FORBIDDEN CITY. *Sound films about Nepal and China.*

Monday December 17 at 8.30 p.m.
SWISS ASCENT OF EVEREST AND LHOTSE. *By Albert Eggler.*
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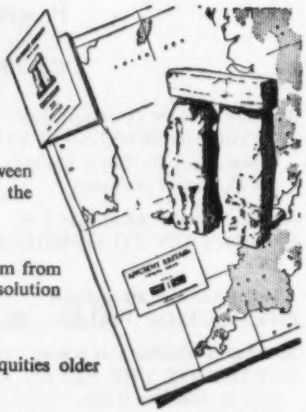

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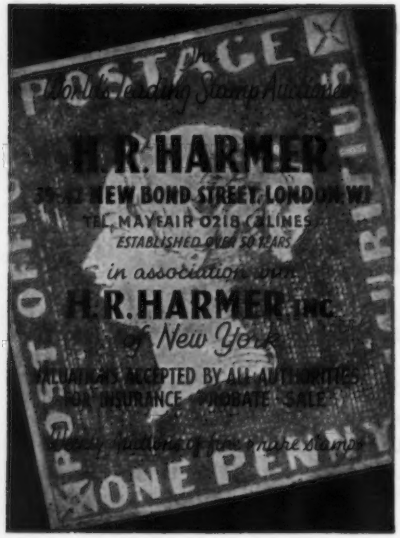

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GEOGRAPHICAL JOURNAL

Vol CXXII Part 3 *September 1956*

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SIR JAMES MARSHALL-CORNWALL, K.C.B., ETC.

A YEAR AGO we celebrated our 125th Anniversary and it was natural that at that time our thoughts should have turned back to our past achievements. This year it is perhaps more appropriate to look forward to the future, to ask ourselves to what goals the study of this world of ours is leading us, and, as a corollary, to ask ourselves what we in this Society are doing, and what we can do in the future, to fulfil the purpose of our original founders—"the advancement of geographical science."

There appear to me to be two main trends, or processes of evolution, to which we must direct our attention. The first is that the unknown surface areas of the world, both lithosphere and hydrosphere, are steadily shrinking. That is to say in future there will be less scope for original discovery and exploration of those *terrae reclusae* which, a century ago and half a century ago, provided the loadstone for our endeavours. The second trend to which I would draw attention is the ever accelerating expansion of education and culture among the populations of this country and its affiliated oversea territories.

Both of these tendencies are patent and indisputable, they are the natural results of evolution; on the one hand, the shrinkage of unknown territories is due, partly to the cumulative achievements of past explorers, partly to the rapid technical advance in the methods of locomotion and navigation by land, sea and air. On the other hand, the spread of education and culture is the outcome, not only of social evolutionary change and a general rise in living standards, but also of improved techniques in the diffusion of information, such as the cinema, radio and television. These two evolutionary phenomena call for corresponding changes in the methods to be adopted by this Society "for the advancement of geographical science." The first trend (the reduction in unknown territories) must, as a corollary, impose on us a more thorough exploitation of the conquered fields. To use a German military term, it means that we must concentrate the *Schwerpunkt* of our attack on individual centres of resistance, instead of bombarding a wider front. We must intensify and localize our scientific research; we must make less use of the telescope and more of the microscope.

Some of you may object that this specialization will adversely affect the wider study of geography; that we will drive our students into outer fields, such as geology, glaciology and meteorology. I disagree; all these are specialized disciplines and branches of research, but they are all embraced under the aegis of "geographical science." Medicine has not suffered, it has gained, by intensified specialist research in anatomy, biophysics, embryology, neurology, etc. But how

can we intensify this effort? The answer lies in the fact that human endeavour must have an incentive. Half a century ago there were only two university chairs of geography in the British Commonwealth (namely at Oxford and Cambridge) and only a handful of undergraduates studying for a geographical degree. Today, in this country alone, there are 28 professors of geography, over 200 university teachers of geography and 1750 undergraduates reading for honours in geography. That result is largely due to the efforts of this Society. But much still remains to be done. Scholarships, bursaries or fellowships at most of our universities are now available for geography and there have been notable advances in this respect at both Oxford and Cambridge since the War. But here too there is more that *could* be done. It was due to the efforts, financial and otherwise, of this Society that geography was originally established as a subject in university education. It is now equally our duty to ensure that the proper incentives are provided to encourage specialization in geographical research, and the best way to do so would be to ensure that the scholarships available in geography should compare favourably with those offered for the older established faculties. This should be done, not only at Oxford and Cambridge, but at all those British universities where geography is now taught to increasing numbers of students. I am not at all sure that, of recent years, the Society itself has done all that it should in directly supporting geographical research of this kind. As usual, of course, lack of funds is the main obstacle. But if funds could be found, and university support were forthcoming, I personally am convinced that our Society could make a most valuable contribution by founding a junior fellowship or studentship for research—it might appropriately be called the "Mackinder Fellowship"—to be held for up to two years, to ensure a rotation of post-graduate students, reading perhaps for an advanced degree. Working in the Society, they would not only be at the hub of geographical activity, but would have at their disposal the unrivalled resources of our Map Room and Library. This is not an entirely new idea; a geographical studentship, though mainly for study abroad, was founded jointly by Oxford University and this Society towards the end of the nineteenth century and was awarded in four consecutive years. It seems a pity that this should have lapsed. I want to see our Society become the focus of geographical research, as it has already become the forum for geographical discussion in this country.

As geography, in earlier years almost identical with exploration, has now become an academic subject in its own right, the claims of academic geographers, as well as of travellers, must be duly recognized in the distribution of our medals and awards. In this connection, I would like to point out that our funds available for distribution as awards are extremely small. In most cases, these awards are the result of bequests made many years ago, since when the value of the pound has been sadly diminished. For instance, the actual value of the Murchison Grant, perhaps our most coveted one, which was instituted in 1871, now amounts only to £35, a derisory figure. Our awards, therefore, have dwindled financially to merely token distinctions and are no longer, as originally intended, bursaries for the encouragement of further study or travel. Our Council would greatly like to see these awards stepped up to some more adequate figure, say £100 annually, but we lack the funds to endow a project of this nature. If any benefactor or foundation could provide us with gifts or legacies to meet this purpose, the "advancement of geographical science" would be greatly benefited.

Let us now consider the second evolutionary tendency to which I have referred, namely the ever-broadening basis of our popular education and culture. This

means that increasing numbers of our fellow citizens are becoming receptive to the intellectual appeal of geographical interest and study. How are we to cater for this additional demand, this thirst for geographical education? Our Society, I feel, has a definite responsibility in the matter. But how in practice can we meet this popular educational need? Certainly not by lowering our scientific standards. As we have already seen, we must concentrate still more intensively on technical research. But, simultaneously, we must seek by other channels to extend the appeal of geographical interest to wider circles. We must in fact achieve a dual purpose: on the one hand to set a higher standard for technical research, on the other to satisfy the geographical thirst of a wider public. We have already taken certain steps to meet this latter demand; for some years past our afternoon geographical film meetings have attracted large and appreciative audiences; as have our Christmas lectures and exhibitions for children. This year, we have carried the process a step further: the *Geographical Magazine*, a monthly illustrated periodical with a wide popular appeal, was established twenty-one years ago in a somewhat loose connection with this Society. Two months ago the major share in the ownership and control of this magazine passed into the hands of a Trust of which I, as President of the Society, am chairman. The link between our Society and the *Geographical Magazine* has thus now been considerably strengthened, and this will in practice allow the Society to reach out to an ever widening circle of interested "lay readers" (if I may so call them), through the medium of the *Geographical Magazine*.

After having made this rather sweeping *tour d'horizon* of our plans for the future, I must now shortly review the happenings of the immediate past. The past year has seen the launching of another great and ambitious effort in polar exploration—the Trans-Antarctic Expedition, the preliminary report on which we heard in this hall last month from its dynamic leader, Dr. Vivian Fuchs, a Fellow and Medallist of this Society. In accordance with our past traditions and practice, our Society has contributed its moral and financial support to this expedition, and six members of our Council are included in its Committee of Management.

A large number of other expeditions, many of them organized by undergraduates at our universities, have also received advice, encouragement and financial assistance from our Society's funds. Their geographical range this year is remarkably wide and covers the Arctic, Africa, Asia and South America, Gough Island in the South Atlantic, and in the Antarctic, South Georgia, from which Mr. Carse's expedition has just returned. As the enthusiastic writer of *The Times* article about the Society pointed out last March: "It is not with books and drawing-boards alone that the Society does its geography, but in the desolation of the polar night, the heat of deserts and the poisonous oppression of the jungle." This year the Society's contribution towards the cost of these expeditions has amounted to £1130. In addition, £450 has been contributed by the Geographical Magazine Trust. Then there are the grants for mountain exploration from the Mount Everest Foundation, of which the Society, it should not be forgotten, is (with the Alpine Club) one of the constituent organizations. Through these different channels, with all of which the Society is directly or indirectly associated, expeditions this year have received a sum in grants totalling over £12,000.

The great increase in the number of expeditions seeking grants and support of other kinds, such as surveying instruments, is only one aspect of the increasing financial burden which the Society must now carry. I will not deal with finance in any detail. I will leave that to our able Honorary Treasurer, Mr. Leonard Brooks,

who is also Chairman of our Finance Committee. Later in the proceedings he will deal with this and comment on the highlights of the financial section of our Annual Report. There are, however, one or two major financial matters to which I must refer. Firstly, and on the credit side, your Council is indebted this year to the Pilgrim Trust for a generous grant of £2000, to go towards making up arrears in the cataloguing of the Library and Map Room. This work, which has been held over for so long because of lack of staff and of equipment, is already in hand. Another valuable contribution comes from the Mount Everest Foundation, in the form of a grant of £1000 towards the purchase of surveying instruments. Demands for these instruments, which are now very expensive, have become exceptionally heavy, especially from expeditions engaged in mountain exploration, as a result of the encouragement provided by the Foundation itself. All these expeditions—and nearly all of them these days include mapping in their programme—have come to the Society for their survey equipment, but we have found it impossible to meet all their needs. We have, during the course of the year, received one or two additional small donations and legacies: one of £200 from a late Fellow, Mrs. Man Stuart, and one of £100 from Colonel Allden. For these we are grateful.

On the debit side of the picture, there is first of all the increased charge for postage of printed papers which has hit us hard, as it has hit other learned societies which are unable to pass on such increases in the way that commercial organizations can do. Worst of all, however, is the steep rise in the cost of production. As a result of recent wage and other increases, I calculate that the annual cost of printing our *Journal* will be increased by about £1200 per annum, making a total cost of £5350 for four numbers of the *Journal*. This, I think you will agree, is a formidable burden. We have to meet this additional charge from our own resources, since the *Geographical Journal*, like other scientific publications, has a very small public sale, and is, of course, issued free to all Fellows.

Another heavy item of expenditure has been in connection with the Society's house. More than £2000 has had to be spent on changing the outdated lighting system in the old building. Though this may lead to economy in future years, it is a heavy initial outlay. Then too there are the repairs and painting which, this year, will amount to not far short of £1000.

As you know, we have been trying to keep pace with these increasing costs out of our own resources and without further recourse to Government aid. To this end we instituted Corporate Membership and have now eighteen Corporate Members. We hope that these will increase. But even this additional revenue has not enabled us to balance our accounts this year. For the first time for a good many years we felt bound to seek an increase in our annual parliamentary grant of £2000, which is primarily given to cover the cost of maintaining a public map room. Since 1949, when the Society's grant first reached its present figure, the cost of the map room, in terms of salaries and materials only, has increased by over £1000. The Treasury, however, regretted that they were unable to recommend an increased grant at the present time. Meanwhile, a considerable proportion of the time of the staff is devoted to helping government departments in different ways and, as the writer of *The Times* article last March truly said: "Departments of State have had a return for their money."

Despite these difficulties, the internal activities of the different sections of the Society have been well maintained. Approximately 10,000 volumes have been borrowed or consulted in the Library; some 10,000 sheets of maps and a number of important atlases have been added to our map collections; the whole of the copy

for the general index to the *Geographical Journal*, Volumes 101–120, has been prepared for the press. In the Drawing Office, further progress has been made on the map of the Hadhramaut (southern Arabia) on a scale of 1/500,000; this map, although unfinished, proved to be of the greatest value for military and political purposes during the recent troubles in the Aden Protectorate. Work has also been progressing on some detailed maps of central Peru, based on the surveys of Dr. J. V. Harrison of Oxford, and a further project is in hand for a map of the Everest region, in which we hope to be able to include material brought back by Swiss, French and New Zealand expeditions in addition to our own. This map will be prepared in cooperation with the Alpine Club, and should be a fitting climax to many years of international effort in the exploration of the Everest region of which the culmination this year has been the magnificent ascents by our Swiss friends of both Everest and Lhotse. Our evening meetings have continued to cater for the world-wide interests of our Fellows. Last November, in conjunction with our friends of the Alpine Club, we had to take the Festival Hall for the outstanding lecture on the climbing of Kangchenjunga by Charles Evans and George Band. Other lectures of particular appeal were given by Sir Miles Thomas, Sir Mortimer Wheeler, Miss Freya Stark, Sir Gavin de Beer, the Director-General of the Ordnance Survey and Dr. Vivian Fuchs. Our afternoon film meetings, too, have proved very popular, and our Christmas meetings were attended by some 2500 young people and their parents. In connection with one of these Christmas meetings, the exhibition of animals lent by the London Zoological Society, to illustrate geographical habitats, was an enterprising and successful innovation.

I think I can assure the Fellows of our Society that your Council is devoting every effort to maintaining the traditions we have inherited, while marching in step with modern developments to meet the geographical needs of a changing world. Our activities continue to roll on like a mighty stream, gathering strength from confluent tributaries. I am glad to be able to report that our Fellowship too shows a steady increase. We have now attained a fresh record of 6585 Fellows in addition to 220 Associate Members and 18 Corporate Members. Since the Society's efforts are so directly dependent on subscriptions, I hope that every individual Fellow will act as a Recruiting Sergeant, and bring in new and suitable candidates for election during the coming year. I want to see our numbers raised to 7000. Finally, I must pay a tribute to the loyal support which I have received throughout the year from my colleagues, the Honorary Secretaries and the other members of Council; it has been a constant pleasure to preside over such a harmonious and distinguished team of fellow-workers. Nor can I omit to record the devoted and efficient service rendered by our permanent staff under our able Director and Secretary, Mr. Kirwan; they have vied with each other in maintaining the high standards which have become traditional in this great Society of ours.

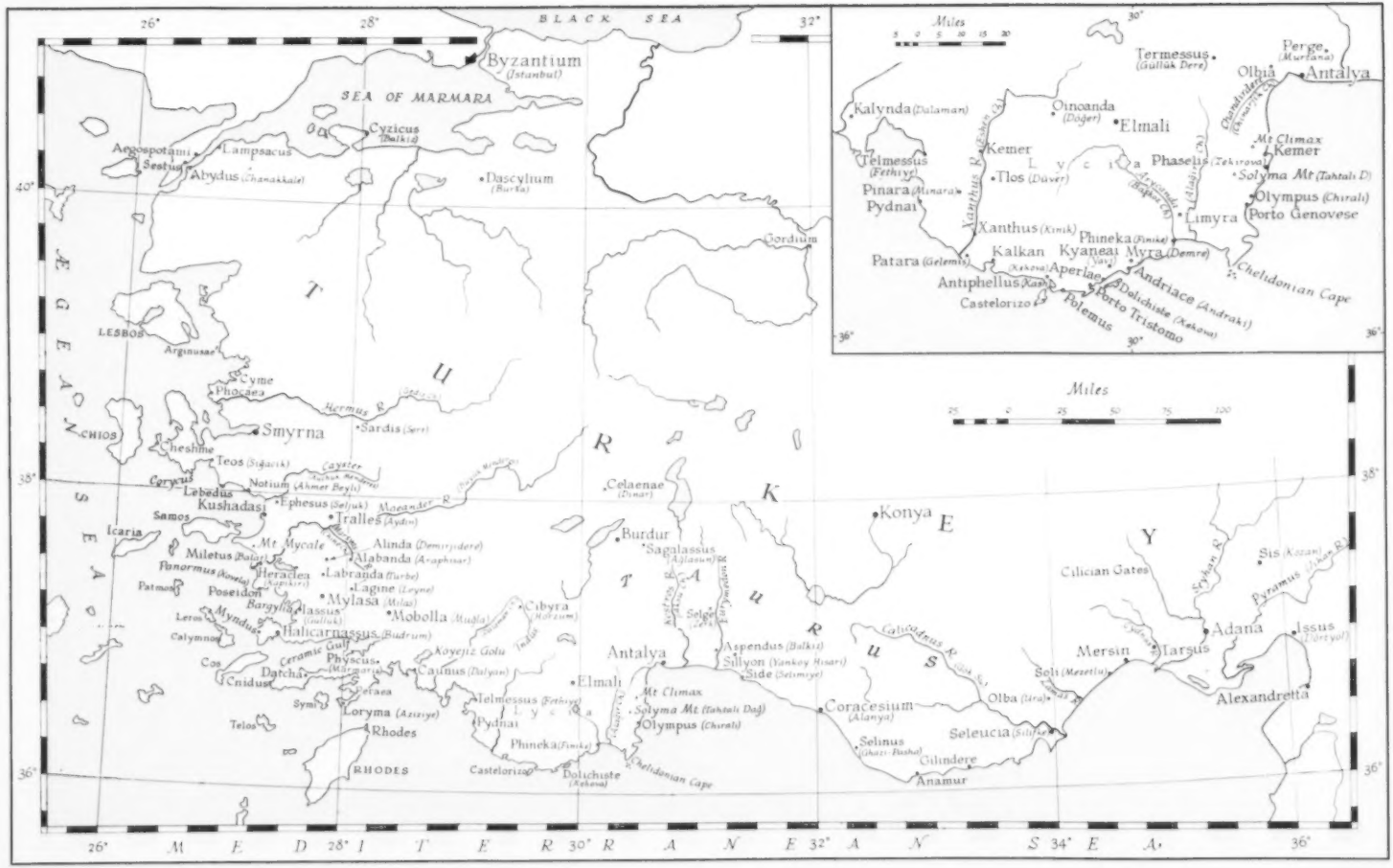
ALEXANDER'S MINOR CAMPAIGNS IN TURKEY

FREYA STARK

I FEAR IT IS rather presumptuous to stand on this platform with no exploration to talk about. My journeys in Turkey during the last three years were not of that kind, and I have to rely for your entertainment tonight on my photographs which illustrate a beautiful country, and on a subject which must always be of some interest, the march of Alexander in the course of his more obscure campaigns on the way to Issus. They have not often been followed by travellers on the spot, and my object in this lecture is to show you the landscape through which that army of young men travelled in 334 B.C., after the battle of the Granicus and the surrender of Miletus had given them a base on the Anatolian coast. This march through Asia Minor, which lasted more than a year and included a number of small separate campaigns, has been eclipsed by the importance of what came later, and also by the scantiness of the information left us. It is one of the few examples in history of a successful naval war fought out on land.

Instead of taking the great Southern Highway that ran easily down the plateau of Anatolia, Alexander risked his communications by following the intricate and difficult way of the west coast, where he branched off—even while the still unconquered Darius was gathering his strength—into one little campaign after another to keep the sea coast linked up with the interior. His mainland communications remained precarious throughout Alexander's lifetime and were only secured by Perdiccas as soon as an army became available after his death. Nothing but the need to destroy, or rather to take over, the Persian naval power at its source—the half-Greek half-barbarian cities of the coast with their population of sailors and hillsides of timber—can explain the choice of this wild and dangerous route for the march through Asia Minor. It was a deliberate choice. Alexander's fleet was inferior to the Persian and he could not risk a sea battle. He had no money to pay for new crews—he had set out on his venture with 70 talents, the equivalent today of some £15,000 or £16,000, in his treasury: and the Greeks of Asia Minor were ready (Arrian makes Alexander himself say so) "to blaze into revolt against him at the first whisper of a naval defeat." The picture of them as an oppressed minority longing to be liberated was largely the fashionable propaganda of that time.

Alexander did extremely well with his small forces. One hundred and sixty ships forestalled the four hundred of the Persians—Cypriot and Phoenician mostly—and prevented the relief of Miletus: and it was on top of this success that he came to the remarkable resolve of disbanding his navy. His father's general, Parmenion, pressed for a naval battle. An eagle had perched on the shore, near the Macedonian vessels, and the omen seemed good. But Alexander refused. His motive is clearly given by Arrian: want of money at the time and the fear of a set-back with even a part of his armament. "He reflected that . . . as he now held Asia with his land troops . . . by capturing the coast bases he would break up their fleet, since they would have nowhere to make up their crews from, and in fact no seaport in Asia." This, then, explains the strange and fascinating march, which I have followed in a desultory way and hope next year to investigate more fully. I have gone by land only over the


BLACK SEA
SEA OF MARMARA
AEGEAN SEA
MEDITERRANEAN SEA
TURKEY
LYCIA
Byzantium (Istanbul)
Cyzicus (Balkiz)
Aegospotami
Lampsacus
Sestus
Abydus (Chanakkale)
Dascylium (Burka)
Gordium
LESBOS
Arginusae
Cyme
Phocaea
Hermus R. (Gediz)
Smyrna
Sardis (Sert)
CHIOS
Cheshme
Teos (Sigacik)
Caystrus R. (Kucuk Menderes)
Cerycus
Notium (Ahmet Beyli)
Lebedus
Ephesus (Seljuk)
Maeander R. (Buyuk Menderes)
Kushadasi
Tralles (Aydin)
Samos
Icaria
Mt. Mycale
Alinda (Demirjydere)
Miletus (Balat)
Alabanda (Araphisar)
Panormus (Koreki)
Heraclea (Kapikiri)
Labranda (Turbe)
Patmos
Poseidon
Lagine (Leyne)
Bargylia
Mylasa (Milas)
Leros
Myndus
Alassus (Gulluk)
Mobolla (Mugla)
Halicarnassus (Budrum)
Calymnae
Cibyra (Horzum)
Kovenz Golu (Indian Lake)
Ceramic Gulf
Physcus (Margarites)
Cos
Datcha
Caunus (Dalyan)
Cnidus
Cnidaea
Symi
Loryma (Azziye)
Telmessus (Fethiye)
Pydnai
Rhodes
Telos
Phineka (Finike)
RHODES
Castelorizo
Dolichiste (Kekova)
Chelidonian Cape
Celaenae (Dinar)
Burdur
Sagalassus (Aglasun)
Konya
Cretan Gates
Selge
Eurymedon R. (Koprusu Cayi)
Antalya
Elmali
Mt Climax
Solyma Mt (Tahtali Dag)
Olympus (Chirali)
Aspendus (Balkis)
Sillyon (Yankoy Hisari)
Side (Selimiye)
Coracesium (Alanya)
Calycadnus R. (Goksu R.)
Selinus (Ghazi-Bashi)
Seleucia (Silifke)
Gilindere
Anamur
Cilician Gates
Sis (Kozan)
Pyramus (Jihun R.)
Sarus R. (Seyhan R.)
Adana
Issus (Toprakol)
Mersin
Tarsus
Soli (Mezetlu)
Cydnus R.
Olba (Ura)
Alexandretta
Termessus (Gullük Dere)
Perge (Murtana)
Olbia
Antalya
Kalynda (Dalaman)
Oinoanda (Doger)
Elmali
Chandondere (Chandondere Cay)
Mt Climax
Kemer
Telmessus (Fethiye)
Kemer
Lycia
Phaselis (Tekirova)
Xanthus R. (Koprusu Cay)
Tlos (Duver)
Solyma Mt (Tahtali D)
Arycandus (Kapaz Cay)
Dalaman Ch.
Pinara (Minara)
Pydnai
Olympus (Chirali)
Limyra
Porto Genovese
Xanthus (Kinik)
Phineka (Finike)
Kalkan
Kyaneai
Myra (Demre)
Patara (Gelemis)
Aperlae
Andriace (Andraki)
Antiphellus (Kas)
Dolichiste (Kekova)
Chelidonian Cape
Castelorizo
Polemus
Porto Tristomo
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26°
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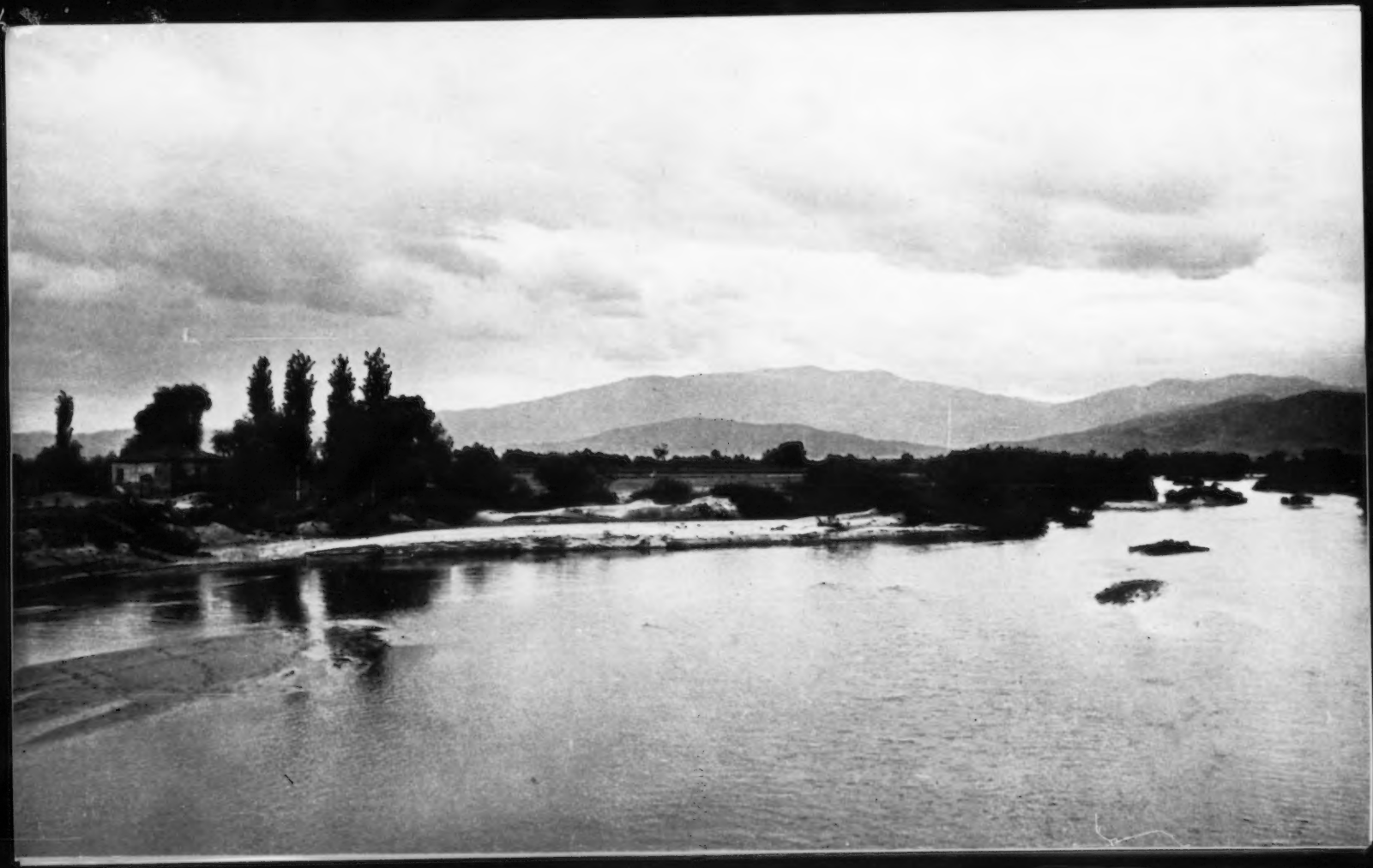
MEDITERRANEAN SEA



most northerly portion of the road, through Caria. After that, the kindness of Mr. David Balfour, then our Consul in Smyrna, enabled me to travel twice down the coast with him in his little motor-sail-boat *Elfin*, visiting the long promontories which Alexander by-passed, and touching his route at small landing stages which still mark the forgotten seaports of those days.

His first care, when Miletus was settled, was to march through Caria to Halicarnassus—now Budrum—where the main Persian defence was centred under Memnon, a Rhodian mercenary captain. Caria was a Hellenized, but not a Greek country, west of the Marsyas river, now the Chiné Chay. The old route, where one is now liable to be swamped, passed through little towns at the edge of the hills, whose ruins still show. Alexander was met here by the dispossessed queen of Caria, Ada, who had retired to her fortress of Alinda. It is now called Demirjidere, a modern village snuggled in ancient walls; the old flagstones still lead to an acropolis, and an agora built in the Hellenistic Age overhangs the town. The Carians had adopted the Greek way of life, and the walls and theatre of Alinda are as good as those of Ionia. They overlook a fertile country bounded by the rocks of the Marsyas gorges, and were easy to hold. And the queen was a sound ally: not only her own troubles with a brother-in-law who had ousted her, but a personal liking for the young conqueror seem to have influenced her, for she adopted him as her son. He finally reinstated her in Caria—a wise policy, for the province was closely tied to Persia. It had been the home of Tissaphernes, the Persian governor, two generations before.

Alexander marched across wooded country to Halicarnassus, and saw it spread below him round the bay, with the king's palace close to what is now the castle of the Knights, and two high citadels. It was to all intents a Greek city, and had been counted among the Dorian colonies of the coast. By the middle of the fifth century B.C. it spoke Ionian and, when Alexander came, the tomb of Mausulus, the Carian king, had recently been finished by the greatest architects and sculptors from the mainland of Greece.

I am not dealing with major battles, and will therefore leave the famous siege, and only take you to the little city of Myndus, which still keeps its name near by. Some sympathisers here agreed to open the gates one night at midnight, and Alexander rode across the hills with his guards, some cavalry, an infantry battalion and some skirmishers—but found no sign of surrender. Troops sailed round from Halicarnassus to help the defenders; and Alexander—who had no navy and no siege engines with him—withdrew. Myndus submitted only after the death of Memnon and the capture of Tyre, when the sea war was over. The side where the attack was made is now open cultivated land on the plain; but on the hill that slopes up behind the town the walls of Myndus still look remarkably strong. A natural ridge of rock is their basement; the work of the Myndians crowned it, and one can see every stage of the wall-building, from the rough heaping of boulders to the finely-cut stone now mossed over with age. One can imagine Alexander measuring the obstacle in his mind and deciding against it. The walls also of Halicarnassus exist, but the atmosphere there is medieval, since its ancient palace, secret port, and arsenal have been succeeded by the castle of the Knights of St. John, in whose walls the stone and marble of the mausoleum lie embedded and hacked to pieces. From the higher ground of the bailey, inside the curtain, one can look across the bay to the little island and the fortified hill to which Memnon and the Persian forces retreated when they had lost the city. Alexander left his general Ptolemy and three thousand men to carry on the siege of these forts, while he marched south. He took

Marsyas river (Chiné Chay) near Alinda (Demirjidere)

what is still the direct road, cutting out the Doric peninsula and Caunus—places which came over to him together with Myndus when the Persian forces in Caria were finally defeated in his absence. He entered Lycia near what is now Fethiye and was then Telmessus. It was famous since very early times for the gift of prophecy—shared by women and children as well as men—and the seer whom Alexander had with him in Miletus and carried on with him to India was a man from Telmessus, and no doubt one of his informants about Lycia. There must have been much good organizing before the peaceful surrender of these towns took place. One of the most remarkable things about these campaigns is their efficiency in the absence of maps. Alexander himself had a geographical mind, and information was made easier by the spread of the Greek language and by the great increase in the numbers of Greek mercenaries or ex-mercenaries scattered everywhere since the Persian kings had come to depend almost entirely upon them in their foreign and domestic wars. Perhaps the chief historic factor in the fourth century B.C. is the growth of the professional armies.

Whether it was his soothsayer or others who prepared the way for him, Alexander found an easy welcome in the beautiful valley of the Xanthus, now the Eshen Chay —the centre of Lycia. The city itself and thirty smaller strongholds all surrendered, scattered round the fertile plain already celebrated in the Iliad—"a fair demesne of orchard land and wheat-bearing tilth" as it still is today—or perched on slopes where eastern torrents pour down from the Ak Dağ, the ancient Massicytus. It was now winter, and a rather obscure interval follows in the march to the south. Alexander left the coast route to attack "the Milyan territory as it is called"—a vague district of fortified villages inhabited by rough and warlike Pisidians. It stretched north and east in a rather indefinite way through the high valleys and pockets of the plateau, and there is, as far as I know, no indication to say how far inland Alexander advanced in this winter campaign. The country he went to was reckoned as part of Lycia, so that it is most likely to be the north-western end of the district, reached from Xanthus across the shoulders of the Xanthus gorges. He went up again into the Pisidian country on a later campaign and dealt with its easterly districts round Termessus and Sagalassus—so that presumably the first expedition was confined to the west. I drove up from Xanthus with Mr. Balfour in his Land Rover; we reached the beautiful highlands where the river flows clear and pastoral by the ruins of small cities, and climbs gradually to its watershed. Then the road looks north to where the flatness of the Anatolian plateau begins, still enclosed in ridges of hills, where the headwaters of the Indus, the modern Dalaman Chay, are now being regulated, in what has ever been a fertile agricultural region.

In Cibyra, close to the modern Horzum, Strabo in the first century B.C. still found Lydian, Lycian and Pisidian spoken, as well as Greek. It is the natural outlet from Xanthus towards the north-east, and was important as a road centre in Roman days. Its two theatres still show on their hillside, with the name of some patron barbarously carved on the topmost seat; and tombstones are scattered over several miles, on the hills of the necropolis, or beside the way up to the stadium. Whether Alexander came so far in his campaign is not known. He could have turned to the right towards Elmali and down the Arycanda valley. It is more probable however that he came back into the friendliness of the Xanthus valley, and continued along the westerly coast. The main road, such as it is, still runs a little inland under the walls of ancient Kyaneai, through solitudes in which walls and gates and a theatre on its hill seem strangely out of tune. Lion-headed sarcophagi stand

about here, under later walls hastily thrown together out of older fragments, evidently under some threat—probably of Arab invasion. Very old roads, whose limestone slabs have been worn by centuries of use, lead down the gorges to little harbours protected by fortresses of Hellenistic and Crusading times. I would like to linger, for they are extraordinarily beautiful, but they are not strictly on the route of Alexander and we have far to go. The main road dips down dizzily only here and there to the sea. One of these points is in the bay of Andraki, the ancient Andriace, the port of Myra. In this harbour, now silted up with swamp and sand, where a very short clear little river runs down bordered with ruins, St. Paul set sail for home in his captivity, and saw his last view of Asia and the Lycian hills.

Myra and Patara were the chief harbours of Lycia in the Roman age and probably before; and the road went on, as it does now, to Phineka, where the way from Elmali, mentioned above, comes down by the Başkoz Chay, the ancient Arycanda. By one or other of these two ways Alexander must have approached the Chelidonian peninsula. The same routes are now followed. The good road stops with the Arycanda valley; the way on as far as Limyra is fit for jeeps or possibly for the old-fashioned carriage, now a museum curiosity in the streets of Phineka, with long tubular body in which mattresses are laid. Even for this sort of vehicle, the road beyond Limyra stops. The theatre and walls of this city, where tall white squills were blossoming like autumn asphodels, now shelter the tents of the nomads. Their long processions pad along the ancient highway on the way up or down from their mountain pastures.

A road is building round the Chelidonian cape but it has not yet broken its loneliness, and we found that all this country was still roadless and indescribably beautiful, its solitudes peopled only by thin villages out of sight or the columns of smoke rising from nomad tents in the forests. Their flocks had taken over the ruined city of Olympus, which Cicero describes as full of ancient works of art even in his day; and their summer camps are spaced all over the slopes of the Tahtali Dağ or Timber Mountain, the ancient Solyma, from whose summit Poseidon saw Ulysses leaving Calypso's island, and where—according to a legend—roses grow all the year round in the snow. In the sides of the cliffs, as one sails by, one can see the streaks of chrome, which was being mined and carried off from a small jetty, with five or six neat houses round it, although the place was not accessible except by sea or on horseback overland.

Not far from a little village hidden in the forests, is Phaselis, a city once famous for its three harbours, and colonized by the Greeks in very early days from Argos or Rhodes. It had been bought, they said, from the local shepherds for some salt fish, and in the sixth century B.C. it belonged to the Greeks who were settled in the Nile delta, for whom it made a convenient stage on the way north. Its position made it important, for it was the first land sighted on the route between Cilicia and Rhodes, and the pirates in later times "often had to touch there on their outward journey from Cilicia and land there again on their way back, so that they first entered into trade relations and later took the place into partnership." The Rhodians, for the same strategic reasons, made it their base when in 189 B.C. they won the last naval victory against Hannibal, and fought for Rome in this bay overlooked by the Taurus. The Chelidonian promontory was always a sort of frontier between the Greek and Phoenician waters, and its southern coast, completely open to the south and therefore dangerous, made the harbours of Phaselis extremely valuable. They are now ruins, lovely in their overgrown solitude; an aqueduct, a fine high-street paved and drained, and lined with palaces, and two temples and many tombs

remain. We landed on a stage made of seven marble pedestals or altars, thrown face downward in the sea, whose clear little waves are eating the walls and shrines. Tombs with marble lids slide down the banks and are swallowed, and the edges of the acropolis have gone.

Messengers from Phaselis met Alexander with a golden crown and brought him along with all his army through the cities of lower Lycia, which had followed their lead and submitted. This is as much information as we get about his route, and again it suggests one that kept near the coast and its cities. A messenger sent overland from Phaselis through the higher country to reach Parmenion in Phrygia, was obliged to travel disguised in native dress: so that there was evidently no safe connection with the plateau at that time. The difficulty of this western road, so vital because of its sailor population and its timber, but so rugged and devious by nature, and so absolutely in the air to an army that had control neither of the hinterland nor of the sea, must have been constantly in Alexander's mind. As soon as he reached the opening valleys of Pamphylia, he again delayed his advance against Darius, and spent valuable time fighting the tough Pisidians in their hills. This is the measure of the importance to him of the link-up between the coast road and the plateau. Meanwhile, with the Pisidians on the heights, he had to reach Pamphylia from Phaselis, round cliffs that, until the new road is built, remain as intractable as ever. They were and are impossible to circumvent on foot when a southerly wind brings up the sea to cover the rocks at their base. The actual place of Alexander's march—where his bodyguard went up to their waists in water—was kindly photographed for me by Mr. Balfour. It is easy to locate, since the coast from Phaselis continues to be level for some time, with an obvious route over the cliff-top, and only stiffens here where the ridges of Mount Climax fall steeply down. I now left Mr. Balfour and his hospitable *Elfin*, having decided to ride overland and look at the Climax route, which his Thracian troops cut with steps in the rock, for the main body of Alexander's army.

It is always rash to say that one has ever been among the first anywhere, but I have not happened to hear of other travellers up the Climax track, since 1842, when two young naval men, T. A. B. Spratt and E. Forbes, described it. It was cloudy as I rode towards the gorge in the morning, having landed at Kemer a short way north of Phaselis and there, with some difficulty, found a horse and guide. One can see why the name of Climax came to be given to this massif of hills. Step after step they rise from a narrow steep defile—not one mountain merely, but a series of shoulders one behind the other, with the Kemer torrent tumbling in its ravine below. In some places the path must still be as the Thracians cut it; there is no room for any other, and centuries of passing up and down have laid bare the worn, smooth, rocky skeleton of the hill itself. The rock rises like a vast funnel on either side, and the bed of the ravine is filled with many varieties of trees in great luxuriance—plane, Aleppo pine, wild olive, myrtles ten feet high or more, cedar, arbutus, pomegranate, pear, cornel and carob. One rides up from sea level for four hours without seeing a sign of cultivation, for which there is in any case no room. The gorge widens gradually and splits where a wooden bridge thrown high across the chasm crosses the Kemer torrent far below. It comes down through a forest solitude from the high pockets of Tahtali Dağ, while the path zig-zags away to the right under forest shadows, up a more easterly valley that pours its waters unseen under tree-tops far below. Now and then, at very long intervals, a nomad Yurük came walking down. Above the head of our valley we reached an open corrie with fields and a few houses, and the ruins of a medieval castle in their midst. It

Alinda: modern Demirjidere with ancient flagged road

The theatre, Alinda

Promontory of Myndus, looking south-east

Tomb on coast road from the plateau to Kekova sound

would have taken an hour or more to visit it and the weather made it unadvisable to linger. We soon came out on grassy uplands, which are the hub of the wheel from which the Climax streams drop down. Here people live only in summer. It was late May, and we found some of them in a hamlet of wooden huts called Ovajik (Little Plain); and we sat and drank their *yoğurt* on the grass. The place had been visited by Mr. Davis,[1] an English botanist, three years before, and I was, they told me, their second tourist. From this high ground one could see how the whole upland from Myra across the headwaters of the Alağir Chay towards Antalya and the Pamphylian plain is more or less short and easy going compared to the hills and ravines of the coastal route. The raids of the Pisidians became understandable: leagued together on the heights, they were placed as it were on the short axis of a semi-circle and could run down to attack the coast along the spoke of any one of its defiles. Once these heights were conquered, the route across from Lycia to Pamphylia became easy and the ground led with no main obstacle towards the north-west and the plateau. A road, blocked out and still vague in the landscape, which we kept on meeting and losing, showed that modern Turks as well as Alexander are aware of the geographic advantages of the higher ground.

I could not see much before the clouds began to close in around us. It was soon like riding on Dartmoor in a south-west drizzle, only colder. It was essential to get over the watershed before nightfall to reach the first inhabited place in the next valley, and we rode on through what presently turned into a deluge. The whole hillside seemed to be slipping; my horse had gone lame, and Hasan had lost the way. The rain went through my post-war burberry like paper—and we were all very relieved to see squares of wheat and cottages below us as we came out of the curtain of the mist. We were across Mount Climax, and descended into what was invisible at the moment, but turned out next day to be a long and beautiful valley, overlooked by Beida Dağ and by Chalbali Dağ on the north, and with the far peak of Solyma—Tahtali Dağ—just visible, streaked with snow. The valley's name, which I constantly asked for, varied with every village we came to, but the longest stretch agreed with the map in calling itself Chinarjik, and is the Chandirdere of the earlier travellers.

Our village had houses widely scattered in their fields, and we were lucky enough to reach a cottage. It was decorated with trellises and carving and belonged to a well-to-do carpenter. He was away in Antalya, but his two sons and their sisters welcomed us. The horse was unsaddled, the upper room swept, a fire of pine boughs began to dry my clothes, and—some time after the night had fallen—a dinner of eggs and *yoğurt*, bread and honey and milk was brought in on a low table; clean hand-woven towels were placed around for napkins, and the two young men ate with Hasan and me while the women waited. After supper they opened a chest where they kept the treasures that a brother in America was sending—table cloths, nylon shirts, and scarves. They never seemed to have worn them, and handled them lovingly, just as the people who lived in the valley before them may have handled some Attic vase or piece of Egyptian weaving sent by some brother serving with mercenaries overseas. They were as intelligent young people as one could meet anywhere, and I remember their welcome with great kindness, and how the women crept in when I lay in my bed in front of the fire, and tucked the quilt round my shoulders when they thought me asleep.

Next morning was brilliant sunshine. The whole valley shone as we rode through its upland glades and dipped into the forest—a long day's ride descending to Antalya. Most of it in fact was a walk, because my horse was still lame. Here

[1] See *Geogr. J.* **122** (1956) 156–66.

and there, we met the new road, and at other places turned steep corners on the old one, as we dropped from one level to another, where cliffs threw barriers across the defiles and the wide and fertile hillsides of the upper valley floor descend as by a stair. A few new houses were building in the small villages we passed; but mostly they kept to the old fashion, copied centuries before in the rock-cut tombs and stone-carved sarcophagi of Lycia. The tree trunks of the ceilings, that show beneath the eaves, are the origin of the dentil as we see it today.

From our valley, as we rode down its southern slope, one could see the Pisidian heights in the neighbourhood of Termessus on the opposite cliff, and realize how easily the mountaineers there could walk along the comparative level of their highlands and swoop down on the lands of Phaselis below. Alexander's army must have watched their outposts as they marched along the way we were travelling. There is no other seaward descent from Climax except a very difficult one "used only by shepherds:" the broad valley must certainly have been the route. Antalya, visible now in the distance, was then not built. The city of Olbia, some miles to the west of it, has left scarce a ruin, washed away by floods where the mountains end and the plain begins. We came down upon its lands in the evening light, very weary, and found a lorry to drive me across the bridgeless river, while Hasan and my exhausted horse stayed on the other side; and we all looked back with pleasure, as the army must have done, on the descent of Climax. It is rather strange that no mention is made of Olbia, in whose territory Alexander and his escort, and probably the Mount Climax army also, must have rested for a night. They rejoined each other on the flat Pamphylian shore, a lowland crescent between the Chelidonian and the Cilician hills. Five cities are mentioned in this region; all except one are visible in the plain, and their ruins are known today.

As was usual in Alexander's army, the staff work was carefully done: local feuds between one city and another were studied to divide them. Perge, near modern Murtana, was the army's objective and gave no trouble. Alexander then marched on to Side, whose waves still break against the ruin of their ancient mole. It is one of the most lovely sites of Pamphylia, with a great theatre, fountain, walls and arches, and many fragments lying in the grass about it, all of a later day. For it went on, and became rather notorious for friendliness with the Cilician pirates on its borders. It was said to have been founded by Greeks who developed a foreign language of their own as soon as they settled there, different—Arrian says—from the Persian of the natives. The impression given is that of a fundamentally non-Greek population, such as one finds increasingly from Caria and Lycia southward, in all the little towns whose *agoras*, and mints, and tombs and theatres had become naturalized, inspired by a Hellenic civilization that dazzled them in their day. Alexander left a garrison at Side and then turned a few miles inland (away from the roadless area of the mountainous Cilicia), and marched under the walls of Sillyon, a high acropolis with a mixed garrison of Persians and Greek mercenaries inside it. I walked up there on a fine day in May and sat on a seat in its theatre, cradled on the cliff top, looking out to the pale sea horizon across the flat land where the armies of Alexander could be followed in their marching to and fro. It is the most interesting of these towns, from the earliness of its ruined buildings: the beautiful and simple doorways of the palace are still intact. The people one meets in these Turkish ruins are mostly shepherds. They take the trouble to climb up with their flocks to grass that is juicy and tender in the shade of the walls and stones. The shepherd of Sillyon was spinning goat's wool for a tent; he had a hank of it wrapped round his left arm and was twirling it off between his fingers in the sun. It would

take him a fortnight to make enough for his tent, he said—optimistically, I thought. He was glad enough to leave his work and his goats and to show us the ways about the acropolis, which covers a good many acres of ground. From its height one looked down on the lower city, where Roman buildings and a few poor hovels are mixed up together, under earlier watch-towers that guarded the ascent. One can understand the confidence of the garrison in its high security. Alexander marched by and left them. He turned back on his tracks to deal with the people of Aspendus.

Both Sillyon and Aspendus—the modern Balkiz—are a half-day's march inland from the shore, so that it was natural for the army to by-pass them on its route eastward. The Aspendians had sent messengers to Alexander, surrendering their city but begging that it might be spared a garrison. They agreed to pay 50 talents (about £11,000), and to hand over the horses they bred for the Persian king. They now changed their minds, got in their harvests, and shut their gates: and Alexander marched back towards them from under the walls of Sillyon, across the Eurymedon river, the scene of the Greek victory under Cimon a little over 130 years before. Few places can be so easily reconstructed from Arrian's description as Aspendus. It was built, says he, "for the most part on a strong height, sheer, looking over the river Eurymedon." Round this height, on the flat ground, encircled by a small wall, were a number of houses—all of which the inhabitants deserted. Alexander, arriving with his army, entered the vacant wall and camped in the empty houses. The Roman theatre—the most complete example now left us anywhere—was later built on this level land, and its box-like enclosure rises almost to the height of the acropolis described by Arrian. The slope of this, no longer quite sheer, is at its back. In front one can see the level land and the river Eurymedon beyond it, and can imagine the dismay of the citizens when "they saw Alexander himself arrived—just what they had not looked for—and his army all round them. They sent envoys and begged to be allowed to surrender on the old terms. Alexander, seeing that the position was strong, and being himself not ready for a long siege, yet refused the original terms. He demanded their most influential men as hostages, and that they should hand over the horses they had previously promised, and a hundred talents instead of fifty; that they should give obedience to the satrap appointed by him, and pay yearly tribute to Macedon; an enquiry to be held moreover about the territory of their neighbours which they were accused of having taken by violence and now retaining." It looks as if the usual oriental complication had taken place and the friendliness of one city—probably Perge—had precipitated the enmity of another. There is a fine agora on the acropolis, and the ruin of a magnificent Roman aqueduct behind it; and beyond these, inland, one can see the beginning of the ranges of the Pisidian hills. Across them lay the way to Phrygia and the plateau, the vital link with the main line of all overland communications across Anatolia to the north. Falling back to the friendly Perge—a little nearer to the opening to the plateau—Alexander prepared to march past the Pisidian Termessus to Phrygia.

Termessus is now quite uninhabited except for a Yurük tent or two, 3000 feet up in the hills. I walked there from the Isinda road on a spring day, when the trees, all full out around Antalya, were still in bud. They showed the mountain valley through their leaves, and threw their patterns of shadow on temples and sarcophagi, mouldings, carved cornices, fallen columns, and inscribed pedestals, that fill the space between two rocky slopes in which the town was slung. In spite of its Pisidian origin, the inscriptions are all Greek. The town flourished particularly in the age of Hadrian and soon after; but the walls—necessary only on north and south

where the cliffs cease—existed when Alexander passed along the valley that runs by easy stages beneath the northern hill. This is the valley, near a little café, called Gülluk, about six hours' ride from Antalya, which Arrian describes as awkward. A second century B.C. wall is still standing, at the point or near it, where the Termessians held the heights on either side of the road. The track to their city climbs for over an hour before reaching their lowest, eastern gateway, now smothered in trees. My Loeb translation of Arrian places the city *below* the road, which is incorrect. It is high above and very defensible, and its population turned out in force and descended to hold the valley passage that still leads through a main pass to the plateau today. Alexander found the city too tough a proposition to attempt. But he gained the road, knowing that the Termessians would creep back up the hills to their own walls at night time. He bivouacked across the valley, and when they had drifted away, leaving only a guard, brought up his archers, javelin battalions and lighter-clad men at arms, and took the position. It is not really a strong one for a small force to hold, for the valley is wide and open. Alexander then, climbing up the hillside, found the town walls slung across, like the end of a hammock, aslant between two very rocky ridges. Here the ambassadors from Selge found him—a city also in the mountains, farther east, and an enemy of Termessus. They agreed on an alliance, and appear to have deflected Alexander's march towards the easier, more northerly ascent of the plateau in their own neighbourhood.

I was prevented by weather from visiting Selge, as it meant a three days' expedition and the Cilician rain was living up to its reputation. But I was lucky in my day at Termessus. From the top of the necropolis on its western height, where hundreds of stone sarcophagi are tumbled, one can look out across the highlands behind Climax towards the range of Tahtali Dağ and westward to peaks that rise from the floor of the plateau and screen the lands of Lycia. And from the seats of the theatre one can look south and south-east down narrow valleys and see Antalya and the Pamphylian shore. This country Alexander now left and marched northward to the ridges that fringe the Anatolian plains. They rise in steps, enclosing at each level separate plains, small or large, but always flat as lakes—and fertile. And their life must have gone on more or less unchanged until the motor tractor came a few years ago. The carts one still sees there are like Hittite toys several thousand years old. The modern road and the older pass lead up, roughly parallel but a little east of the route from Termessus, past Lake Kestel to the railhead at Burdur. It is a natural way across the Taurus, and the obvious link with the main line from Phrygia to the south. Alexander spent the end of his winter here campaigning, while he could still catch the Pisidians in their villages with their fields under snow. The road from Lycia and Pamphylia to Phrygia must be made safe, and this campaign ties up with that made from the Xanthus valley shortly before: having advanced up the western, he was now attacking the eastern flank of the Pisidian strongholds.

A rugged stretch of mountain country is sandwiched between the lakes of Kestel and Burdur. One turns north-east, off the main road and drives by a poor track through smaller pockets of cultivation, till one reaches the big village of Ağlasun—a name which scarcely disguises the ancient Sagalassus in the hills above. This was "a fairly large city, inhabited by Pisidians, the most warlike of this warlike tribe," who stood on the mountain slope in front of their walls in a position which Arrian rightly describes as just as strong for defensive operations as that of the wall itself. The place was right astride the northern roads, an ideal headquarters for raiders, and Alexander had to take it. From its theatre, now shuffled about by earth-

Approach to Climax gorge from Kemer

The Climax route: track to Antalya

The theatre, Aspendus

Palace door, the Acropolis, Sillyon

quakes, one can look south and see how the vanished city spread along a promontory or ridge. One can see the wildness of the surrounding hills; but the steepness and length of the slope up to Sagalassus is hidden beyond the dip. There, at the foot of the hill, Alexander deployed his Macedonian phalanx, himself with his bodyguard on the right wing, and the territorial infantry touching them, "all under the battalion officers in the order of precedence for the day . . ." The archers, and the light-armed Paeonian, on the right, in advance; on the left, the Thracian javelin men. The cavalry were of no use to him—though it is not the narrowness as Arrian says, but the steepness and roughness of the ascent that must have made them useless. At the top, lining the height, along with the Pisidians were ranged Termessians who had come to help. There is an indescribable feeling of youth about this attack up the steep mountain against the hidden city at the top, led by Alexander who was twenty-two and the generals who were the friends of his boyhood. Already the right advanced wing was on the stiffest stretch when the Pisidians attacked from ambuscades on either side, where they could best approach and the Macedonians were most hampered. They drove back the archers, who were lightly armed: but the Paeonians held firm. The Macedonian phalanx was coming up behind them and Alexander was visible at its head. He usually fought without his cuirass and surely left it behind before this climb. The battle became hand-to-hand, and the unarmoured natives charging the spears were wounded. Some 500 were killed; but most, being light, and at home on their rocks, got easily away. The Macedonians, from weight of armour and want of local knowledge, and also I imagine from want of breath, had little heart for the pursuit, but Alexander pushed on and stormed the city whose main defence lay in the hardness of its hill.

Apart from some stray visitors like myself, its ruins are usually solitary, except for shepherd women who knit while they pasture their flocks. Their children play on the carved cornice of some forgotten building, and the works of which the Sagalassians must have been so proud lie scattered about in fragments here and there. A road runs into the mountains right through the centre of the ancient town, but it is rare to see a car upon it; my taxi required a lot of inducement to go. As we were turning down the hill, to wind with many zig-zags where the Macedonian phalanx climbed so straight, I saw two foreigners rather lost beside a little car. They turned out to be a French husband and wife who were looking for Sagalassus and could not find it in the wide and empty landscape. They had come so far without a word of Turkish and were delighted to find another tourist near at hand to point the way. The modern village below is full of marble fragments, and in early May was one of the most charming places imaginable, filled with running streams, and hidden in trees that blossomed against the snowy hills.

Alexander moved about the country here and subdued the remaining forts of the Pisidians, encouraged by the fate of Sagalassus to surrender. His smaller campaigns in Asia Minor were over, except for a week among the Cilician foothills when—having linked himself up with Parmenion and new reinforcements in Phrygia—he came back to the south by the regular way, through the Cilician gates to Tarsus. He was now dealing with his major war and the battle of Issus loomed before him. Here the Anatolian war ends. But the naval quality of the operations continued to be proved by Alexander's next move—the conquest of Phoenicia and the seven-months siege of Tyre. Not until the Persian sea power was destroyed did he march eastward against the real strength of Persia. I wish my military knowledge were greater so that I might have described these battlefields in a more expert way. But I hope to have given you some idea of the beauty and excitement of their setting.

Alexander never returned to these scenes. The sheep browse on the places where he paused with all his world before him; and, on some unnamed ruin, the little shepherd in his felt coat stands today, looking out on a history that was old already when our modern world began, two thousand three hundred years ago.

DISCUSSION

Evening Meeting, 9 January 1956

Before the paper the PRESIDENT (General Sir JAMES MARSHALL-CORNWALL) said: Miss Freya Stark is an experienced and distinguished traveller. Fourteen years ago our Society awarded her the Founder's Medal for her explorations in southern Arabia. She is also—I quote *The Times*—"a writer of genius." Most of you will have read with great enjoyment her books on travel in the Middle East, such as 'The valleys of the Assassins' and 'The coast of incense.' Latterly, Miss Stark has transferred her affections from the Arab lands to Anatolia. She has followed in the footsteps of geographer-scientists and geographer-archaeologists like Sir William Ramsay and David Hogarth. She has explored thoroughly the south-western corner of Asia Minor. Miss Stark has studied not only the topography on the ground but is well versed in all the classical authorities; she can quote Strabo and a great many Roman and Greek authors whom you and I have never read.

Alexander the Great, after his victory over the Persians at the battle of the Granicus, when he found a footing in Asia Minor, moved through this little-known, wild, beautiful country southwards and then eastwards to the Gulf of Alexandretta until he fought the great battle of Issus and so crushed the military power of Persia. That was a campaign of far-reaching importance. It opened up the whole of the Middle East as far as the Hindu Kush and the Indian Ocean to the influence of Hellenic culture. It was an epoch-making campaign. Miss Stark has studied the topography of that campaign on the ground, and with her knowledge of the classical background she is going to show us the country with the help of her own photographs.

Miss Freya Stark then delivered her lecture

The PRESIDENT: After the passage of nearly twenty-three centuries Miss Stark has described that country so vividly that we can almost imagine the language used by the Macedonian hoplites as they cut steps up the granite cliffs of Climax! Fifteen centuries after Alexander conquered Anatolia the Turks came in from the opposite direction, first the Seljuk Turks, followed by the Ottoman Turks. The Turks have now thoroughly settled down there. They have made a magnificent country of Anatolia. To our great disappointment, His Excellency the Turkish Ambassador could not be with us this evening, but the Educational Attaché of the Turkish Embassy, Mr. Copgil, has honoured us with his presence, and I ask him to say a few words.

Mr. S. COPGIL: On behalf of the Turkish Embassy, I wish to express my hearty thanks to the Council of the Royal Geographical Society for giving me the privilege of addressing you. It gives me great pleasure to thank Miss Freya Stark, who, as we all know, is an authority on the history and archaeology of my country, especially on the Hellenistic period, and whose literary works are known and much appreciated by the Turkish authorities, for the excellent lecture she has just given us. It was most interesting and, speaking as a Turk, it was an added enjoyment to see pictures of my country, especially places which I myself have not visited. May I also take this opportunity of thanking the Royal Geographical Society for arranging such an enjoyable evening. If any members of this esteemed Society wish to visit Turkey for archaeological and scientific purposes, the Turkish Embassy will consider it a pleasant duty to assist and facilitate their journey and stay in Turkey. As we Turks take great pride in the ancient and new works of art which are plentiful in our country, we

believe also that all such works of art are for the benefit of the whole world and belong not only to us, but to all lovers of art and to the human community as a whole. I have also been very much impressed by the kind words of Miss Freya Stark about the kindness and hospitality of my compatriots. I wish her success in her future efforts in the field of archaeology, to which she has already contributed so much.

The PRESIDENT: We have with us this evening one of our Fellows who has also visited Turkey. Sir Thomas White, the High Commissioner for Australia, a Flying Officer in the First World War, was shot down and captured in Mesopotamia. He was then in a Turkish prison camp, from which he got away, and he has visited Turkey several times since on more friendly terms. I hope he will consent to say a few words to us.

Sir THOMAS WHITE: I want to pay a tribute to this brave and indomitable lady, in whose writings we have read of her travels in Arabia. She joins the great trio of English women with Gertrude Bell and Hester Stanhope, who have brought such lustre to the British name in the East—and it is a great name. If one can write a cheque on a piece of paper, obtained in devious ways, and get it cashed in enemy country because it bears a British signature, it says a lot for the British name. It is grand to see the Turk now our ally and one who joins in a pact which will preserve the freedom of the free nations.

Miss Stark has brought to life the campaigns of Alexander, who in his youth was not held back by the thought that there were no more worlds to conquer at the age of twenty-six or twenty-eight. Alexander went right through Asia Minor into India, to Secunderabad, and died at Babylon, not far from Baghdad. His empire was dismembered. Asia Minor is a graveyard of classic nations. Let us hope they will revive again and that archaeologists will go there and dig up the past so that it will bring home to us what we have been told tonight. There are many in this room who have seen much more of the country than I have. I spent about four years there, two of them under circumstances in which we were rather restrained, and we did not have opportunities for archaeology or exploration; but we drank in Gibbon and the Greek writers and learnt something of the civilizations of those times. If we can take an axiom from an opponent, that the greatest philosophy is a study of the past, we will feel that our duty to the present is to ensure that our Empire never falls to the dust as those we have seen in the beautiful photographs tonight.

NOTE: The Turkish place-names are spelt to correspond with the map facing page 294, but are not all in accordance with modern Turkish orthography.

AN ENGLISH TRAVELLER IN THE SIEGERLAND

T. H. ELKINS

THOMAS BANFIELD was a traveller and a writer of some importance on economic matters,[1] with practical experience of industry. In his 'Industry of the Rhine,'[2] published in 1846 and 1848, he gives an account of the use made by man of the varied environments of the Rhinelands that is in the true spirit of human geography. His interest in economics enabled him to penetrate to the realities beneath the picturesque Rhineland landscape:

"Having," he says, "himself found leisure both to enjoy the beauties with which nature has clothed this enchanting river, and to commune with those who dwell upon its banks, he deems it no superfluous task to invite any who have taste or leisure to study more than scenery as they pass along; to inquire with him respecting the account to which people turn the advantages of soil and climate with which they are endowed." ("A" pp. 5–6.)

Banfield's acquaintance with Germany was clearly greater than that of the simple traveller: indeed he had spent some years in that country, and knew its social and economic conditions well.[3] He is doubtless the Thomas Banfield who, in March 1846, was reported as desiring to establish a plant for the preparation of cobalt ore at Müdersbach on the Sieg, an undertaking which is described in considerable detail in his book.[4] His familiarity with the Siegerland undoubtedly explains his elaborate treatment of this one region in a book on the Rhinelands as a whole. Such attention to the Siegerland is, however, merited, since its economy in many ways typifies that of the whole country on the northern flank of the Rhine Uplands, where before the industrial revolution of the mid-nineteenth century, a relatively dense population—about 150 to the square mile in Siegen—was maintained in an agriculturally poor upland with the help of small-scale industries based on the local forests, ores and water power. The Siegerland economy was, moreover, typical of the epoch of small states and mercantilist ideas of state regulation, which had most important effects on the geography of industry and of agriculture. But the Siegerland was also unique in that, over the centuries, it had developed a system of management which linked industry, agriculture and forestry together in a most remarkable interplay of man and of nature, a system which is of the greatest interest to geographers. By the time that Banfield visited the Rhinelands the new technology and the new ideas of liberal economics were everywhere sweeping away the old order: he was thus able to describe the remarkable features of the Siegerland before their final disappearance. That the account he gives is an accurate one can be confirmed

[1] Banfield, T. C., Six letters to Sir Robert Peel on the "Dangerous Tendency of the Theory of Rent advocated by Ricardo," 1843. Four lectures on the "Organisation of Industry," London, 1845.

[2] Series I, 'Agriculture,' London, 1846 ("A" in Text); Series II, 'Manufactures,' London, 1848 ("M" in Text).

[3] Banfield's published works include a translation of Schiller's 'Wilhelm Tell' and, according to the 'Dictionary of Political Economy,' a work entitled 'The Progress of the Prussian Nation since 1805,' based on the work of the German statistician Dieterici.

[4] The writer is indebted for this information to Dr. Wilhelm Guthling, Stadtbibliothek, Siegen.

by comparison with other German writers of the time, to whom reference will be made.

There can be no better introduction to the geography of the Siegerland than Banfield's own account of the journey from the Rhine into this scenically most attractive industrial region:

"From Altenkirchen to Wissen-on-the-Sieg the country becomes more romantic as we proceed, and at Wissen a wild valley, shut in by wooded heights . . . at the bottom of which the River Sieg rolls its rapid waters, forms a striking contrast . . . to the broad valley of the Rhine. . . . Here the elevation of the ground and the circumstance of our being on the north side of the Westerwald, and consequently in a district exposed to cold winds, . . . forbid the cultivation of the vine, and render corn-crops precarious and scanty. The stranger is however at no loss to explain the number and good appearance of the villages through which he passes, for the heaps of earth on the mountain side and the open entrances to galleries carried from low points into the hill-side, remind him at every turn that he is traversing a mining district." ("A" pp. 118–19.)

The country thus entered consists of highly folded and fractured lower Devonian slates. Geologically there is no sharp differentiation between the Siegerland and the adjoining districts of the Rhine Uplands, except in the south where the Devonian rocks are covered by the Westerwald basalt flows and the Tertiary sediments that these preserve. Physically, on the other hand, the Siegerland is a most clearly defined region (Fig. 2), occupying a depression scooped from the upland plains of the Rhine Block by the Upper Sieg and its fan of tributaries. From their steep heads these streams descend through narrow and deeply cut valleys, most of which converge on the town of Siegen in the centre of the region. Beyond this point the Sieg flows westwards to join the Rhine, by the route already described above in Banfield's words, which penetrates the physically least distinct section of the region's border. The geographical Siegerland thus delimited is greater than the *Kreis* of Siegen, including in the west a considerable portion of *Kreis* Altenkirchen (Fig. 2).

The upland border which delimits the region adds greatly to its isolation. To the east and north-east, in the Rothaar, lies some of the highest and least populous country of all the Rhine Uplands. Northwards, the ancient Hellweg towns and the Ruhr coalfield lie some 50 miles distant across the wooded hills and industrial valleys of the Sauerland. The economic attraction in this direction explains why in 1817 Siegen became the southernmost *Kreis* of the Prussian province of Westphalia, and is now merged in the highly industrialized *Land* of North Rhine-Westphalia. Before the Napoleonic wars, however, Siegen had been part of Orange-Nassau to the south, communications in this direction being facilitated by the open upland plain of the Westerwald and by the col over Kalte Eiche to the Dill headwaters. The only obvious break in the hill girdle of the region was in earlier times unimportant, for the deep and narrow valley of the Sieg west of Siegen obstructed rather than helped movement before the nineteenth century (Fig. 1).

From any part of its upland rim, the Siegerland appears as a maze of wooded ridges, one succeeding another until a greater one rises to close the view and mark the distant highland border. Between the ridges the slopes plunge steeply out of sight into the narrow valleys where alone, some 500 feet below, the lower slopes provide a little room, between the floodplain and the forest, for the tightly clustered villages of the Siegerland and for their arable fields. This initially inhospitable region, with its thick forest of beech and oak, was largely avoided by early man. Its

value for settlement was revolutionized when iron began to be worked. Both the La Tène and the succeeding Germanic peoples worked the ore in open pits, and smelted it in wind-blown furnaces, the sites of which have been discovered in hundreds in the uplands of the Siegerland.[1] In Banfield's time, despite great changes in the technique and location of production, iron working largely explained the density of population, for the sale of its products helped to pay for necessary imports of corn. The dilemma was how to provide from the poor local soils some food for the people and also fodder for the many draft cattle, without so diminishing the forests that the supply of charcoal for the iron industry was impaired. It

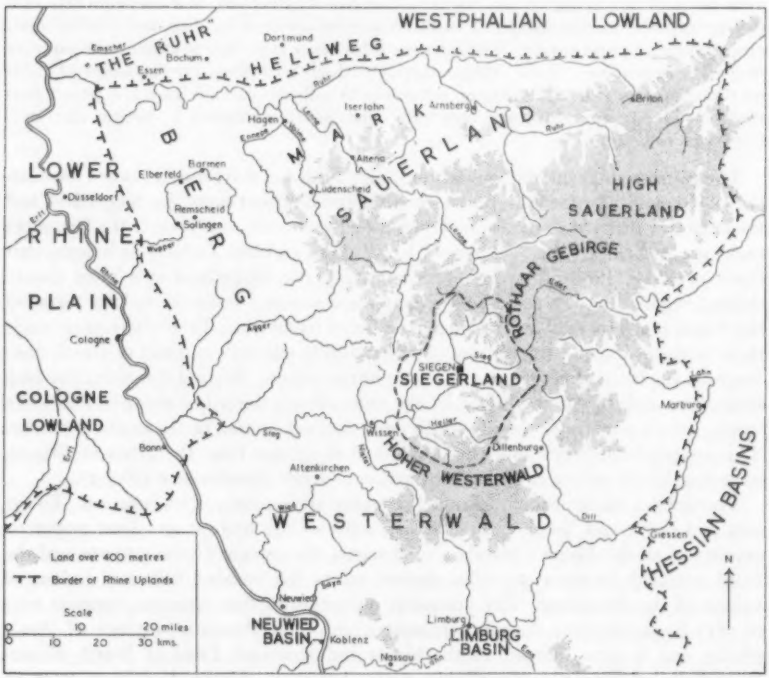


Fig. 1. Position of the Siegerland within the Rhine Uplands

was as an answer to this need that the distinctive Siegerland system of land utilization was evolved.

The Hauberg.—The central pillar of the land economy of the Siegerland was the highly developed oak coppice system known as *Hauberg*, which, in the *Kreis* Siegen of Banfield's day, accounted for three-quarters of the forest area.[2] Its object was to meet the demands of the iron industry for charcoal while ensuring that the forest, which covered about 70 per cent. of the land, contributed to the feeding of man and beast. The *Hauberg* was managed by companies of peasants

[1] Krasa, O., "Frühgeschichtliche und mittelalterliche Eisenschmelzen im Siegerland." *Siegerland*, **13** (1931). "Vom Windofen zum Hochofen." *Siegerland* (New Series) **3** (1948).
[2] Schenck, K. F., 'Statistik des Kreises Siegen,' 2 Aufl., Siegen, 1839.

called *Haubergsgenossenschaften*. Shares in the companies might be bought and sold, but no individual was allowed by law to withdraw his land or to put it to other uses. The extraordinary number of purposes served by the *Hauberg*, and its intimate links with both the agricultural and industrial economy of the Siegerland, may best be seen by following the sixteen to eighteen-year cycle of coppice management ("A" pp. 119–23). In order to maintain an even annual yield, the *Hauberg* was divided into sixteen to eighteen sections, one of which was cut each year in turn. The effect of this system on the landscape was, and still is, remarkable, the blocks of coppice at different stages of development forming a most unusual pattern on all the hillsides. The area to be cut in any one year was not harvested in common by the company but divided among the members in proportion to their shares. This mixture of corporate management with tenaciously held rights of individual ownership of the finished product was characteristic of the Siegerland economy.

The first task of each share-holder, after the melting of the winter snow, was to clear his section of brushwood, leaving the larger oak stems as bare poles. When the sap began to rise, these were stripped of their bark for the important local tanning industry, its sale providing one of the two major sources of cash income from *Hauberg*. In May the trees were cut and left to dry until, in early autumn, the charcoal burner began to work. The sale of charcoal for use in the furnaces and hearths of the Siegerland metal industry was the second major source of cash returns. With the clearing of the trees, the ground was given over to an interesting form of shifting cultivation. In the autumn, each man burned the rubbish on the piece of land he had cleared, stirred the ground between the remaining stumps with the characteristic light ox-drawn plough of the Siegerland, the *Hainflug*, and then sowed rye. By the summer of the following year, the tall corn stooks of the Siegerland would be seen standing among the lengthening oak shoots. With the harvesting of the grain, the *Hauberg* ceased to function as arable land in the possession of individuals, and passed once more into common use. For the next four years the coppice was left for the young shoots to grow and was then again invaded, this time by the village herd, and was used as rough pasture for some twelve years, until ready for cutting again.

The importance of the *Hauberg* to the whole economy of the district is clear. It provided the charcoal supply of the iron industry, although not enough to meet all demands. Similarly, it supplied the tanneries with the most weighty of their raw materials. The crop of rye augmented the harvest from the limited arable area, while the rough grazing enabled the meadows to be devoted exclusively to hay and helped to make up for the lack of other forms of pasture. It is hardly surprising that Banfield described this form of intensive utilization by the people of the Siegerland of a not very promising environment as "a model for their neighbours" and "well suited to the wants of miners, founders, and steel-manufacturers" ("A" pp. 119–20).

Irrigated meadows.—As a mining district, the Siegerland had to maintain a large herd of draft cattle, with which to haul ore and charcoal from the hills to the furnaces, and the metal products to their markets. With so much land covered by forest, it would have been quite impossible, even with the help of the *Hauberg*, to feed this herd—about one to every three members of the population—and also to contribute some food for the inhabitants. The problem was solved by the second of the characteristic forms of land utilization in the Siegerland, the system of water meadows, which produced grass and hay for the stall feeding of cattle ("A" pp. 128–41). These artificially watered meadows were a major element in the

rural economy and the landscape, occupying some 10 per cent. of the area of the country. They covered the alluvial floors of the Sieg and all its tributary valleys, and climbed the lower slopes wherever water could be provided. Where there was sufficient slope for natural drainage, water was taken from a point upstream and carried in a leat along the valley side, from which it was allowed to flow over the slopes beneath through a grid-iron system of distributary channels (*Hangwiesen*). On the flat valley floors, a system of ridged beds, similar to that found in the English Chalk country, was used (*Rückenbau*). The water flowed over the surface of each bed from a channel along the apex of the ridge, while the furrows between served for drainage.[1]

The aim of irrigation was not to supply water in a dry season, although this was sometimes done, but to fertilize the ground with mineral matter carried by the streams. In the days before the use of artificial fertilizers, the yield of grass was in this way increased by about half. The meadows were not grazed, as the cattle would damage the channels, but the grass was cut for stall feeding, either green or, more usually, for hay. These high yields of fodder were obtained only at the cost of continued application of skilled labour, not only in mowing and carting but in the construction and maintenance of the system. A great difficulty lay in the tendency of the meadow surface to rise with the accumulation of silt and humus until it was higher than the level of the channel supplying it. This enforced a periodic breaking of the ground, to remove subsoil, after which the top soil and precious turf were replaced. Further labour was demanded by the compulsory cleaning of the ditches in the autumn of each year.

Banfield remarked that the absence of fences gave the appearance that a whole valley was owned by one proprietor, but that the division of the soil was, in fact, very minute indeed ("A" pp. 129–30). These small pieces of meadow could be bought and sold, but not used for any other purpose. Management was by all the meadow proprietors in common, under the regulations known as *Wiesenordnungen*, which had the force of law. The resemblance to the *Hauberg* which can be seen in the system of management, can also be seen in the intimate linkage with other branches of the economy. Channels serving the meadows were closely related to the dams and leats of the iron industry. The meadows gave a direct contribution to the economy in the form of fodder and, being fertilized by the waters, an indirect one by allowing all the dung from the byres to be reserved for the arable fields. Banfield concluded that "the whole agricultural plan of this district thus combines whatever can be of use to a half-manufacturing population, by . . . producing chiefly what assists the miner, or serves as fodder for beasts of burthen" ("A" pp. 131–2).

Mining.—Banfield's enthusiasm for the agricultural arrangements of the Siegerland did not extend to the organization of mining and manufactures, but his observations are of no less interest to geographers. The industrial basis of the Siegerland lay in the veins of spathic iron ore (iron carbonate) contained in the lower Devonian rocks. Most of the iron mines were contained in a belt running from NNE.–SSW. across the centre of the Siegerland, in which three districts of greater concentration could be observed (Fig. 3). At Müsen, in the north, a group of mines surrounding the Stahlberg mine, which dates at least from 1313,

[1] For an exhaustive account of the systems of meadow construction and maintenance in the nineteenth century see Schenck, K. F., 'Der Siegen'sche Wiesenbaumeister,' 3 vols. Wiesbaden, 1854. Also Monheim, F., "Die Bewasserungwiesen des Siegerlandes." *Forschungen zur Deutschen Landeskunde*, Band **42**. Leipzig, 1943.

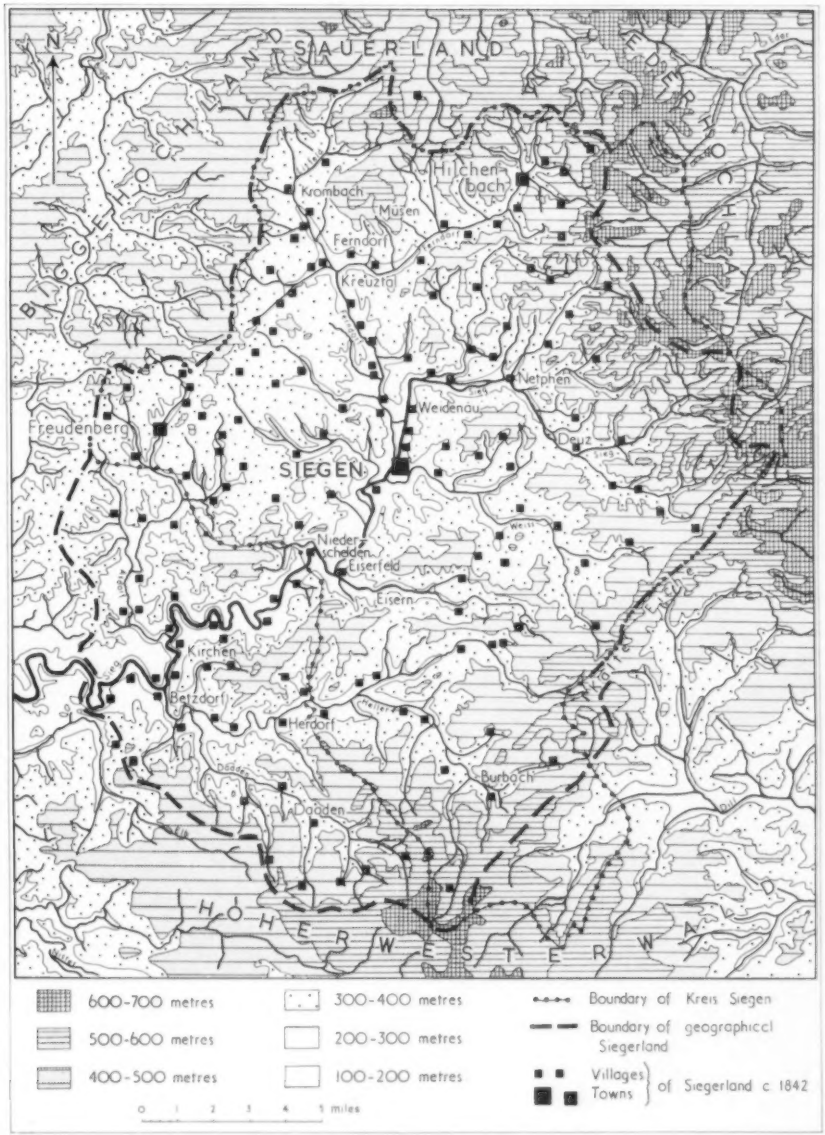


Fig. 2. The Siegerland: relief

(Distribution of villages and towns before the Industrial Revolution is shown within the borders of the geographical Siegerland only)

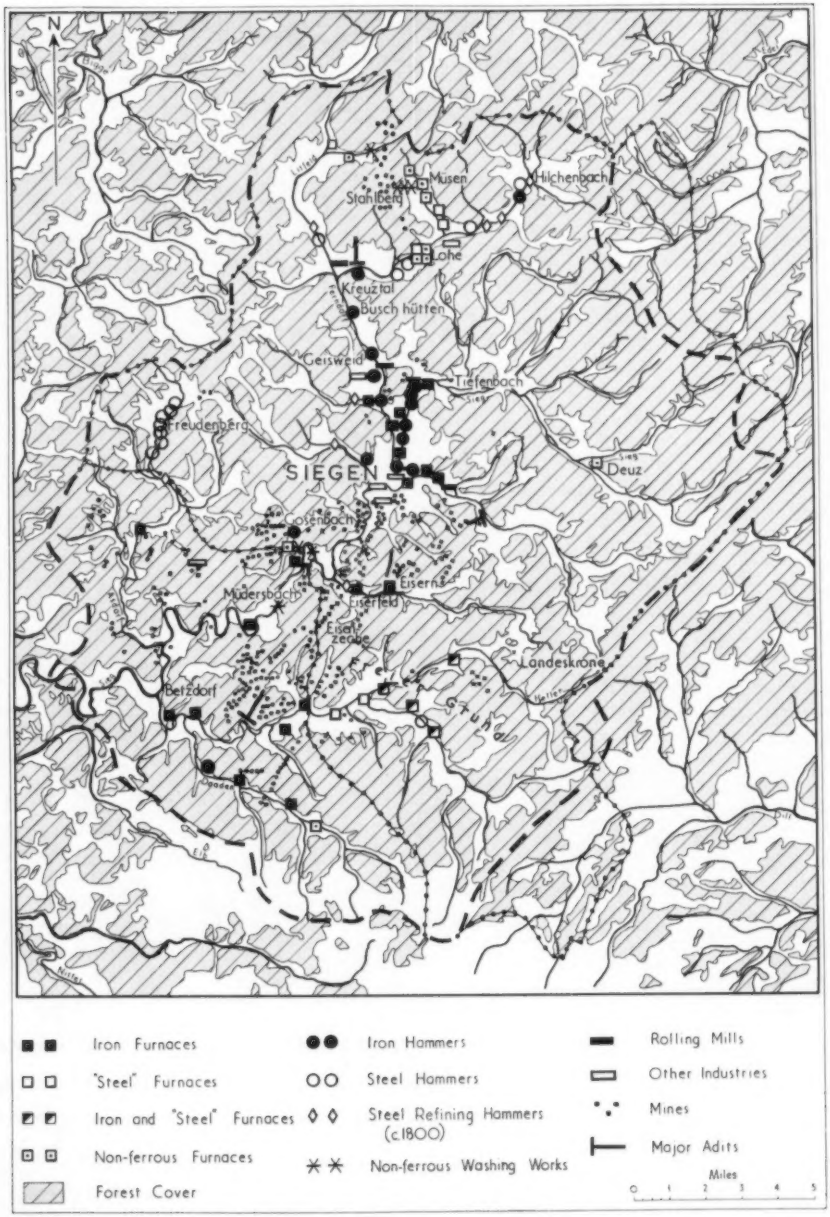


Fig. 3. The Siegerland: industry before the Industrial Revolution (c. 1840)

(Sources: Hütten- und Hammer-Ordnung, 1830; Eversmann, op. cit.*; Schenck,* op. cit.*; L. Heis, Karte der Bergswerksreviere an der Sieg, 1842–3, Berlin, 1848)*

produced the Siegerland "steel-stone" ore. This was smelted locally into *Stahleisen* (*Spiegeleisen*), the basis of the distinctive Siegerland "steel" industry. South of Siegen, the larger group of mines in the district of Gosenbach and Eisen produced six times as much ore as Müsen, but no "steel-stone." [1] Beyond the Sieg watershed, the mines of the Heller valley, situated partly in the district of *Kreis* Siegen known as the *Freier Grund*, and partly in the county of Sayn-Altenkirchen, now *Kreis* Altenkirchen, produced both ironstone and "steel-stone." All mining districts produced small quantities of non-ferrous ores, particularly lead and silver in the north and south, cobalt in the centre, and copper in all three. The total of ore produced was small by modern standards. Schenck gives the yearly production of the *Kreis*, excluding the *Freier Grund*, about 1837 as 43,000 tons of iron ore, with lead (200 tons) as the most important of the non-ferrous ores. The largest yearly iron ore output of the pre-railway *Kreis* Siegen was apparently 230,000 tons in 1856.[2]

The technique of mining in Banfield's day was extremely backward. Since the steam engine was not in use for pumping, the mines were drained by adits driven into the valley sides. Only the ore lying above the drainage adit could be worked, but owing to the 500 feet or more incision of the valleys, the quantity available was sufficient for the limited demands of the time. In 1830, at the then rate of working, the Müsen mines had reserves of ore sufficient for 150 years' working before completion of the new Müsen adit, which was begun in 1826, half finished in 1855, and was intended to provide reserves for 300 years more.[3] Dilatory methods were possible because the demand for ore was kept down by the restrictions on the output of the local iron industry. Export of ore was no longer prohibited, as it had been under the Nassau overlordship, but transport difficulties restricted demand from outside the Siegerland before the railway age. The type of organization of the industry, which bore a strong resemblance to those of the *Hauberg* and meadows, also hardly favoured the vigorous prosecution of mining. Control by the State, which appropriated a tithe of all ore raised, was detailed and cramping to initiative. Mines were both very numerous, and very small on the average, being normally worked by a group of miners who divided the ore between them. According to Schenck [4] there were, about 1837, 383 mines in the *Kreis* (excluding the *Freier Grund*), from which 2344 persons obtained all or part of their livelihood.

The existence of so many small units was particularly favoured by the nature of the mining law in force. In a field so cut up by faulting and so deeply dissected, outcrops of the ore veins were numerous and unpredictable, so that there was always the possibility of a lucky strike. As the law said that anyone finding a mineral had the right to work it, irrespective of the ownership of the land, and as, in the state of technique at the time, little capital was required, it was easy to open a small mine. Eversmann, writing in 1804, complained that a peasant could work a vein that he had discovered with the help of a few companions, take out the ore that could be reached without trouble, and then abandon the rest, since mining for him was only a subsidiary occupation to farming.[5] These various circum-

[1] Schenck, *op. cit.*

[2] Schenck, *op. cit.* Statistical Table. v. Dörnberg, 'Statistische Nachrichten über den Kreis Siegen aus den Jahren 1860–1865.' Siegen, 1865.

[3] Jacobi, L. H. W., 'Das Berg- Hütten- und Gewerbe-Wesen des Regierungs-Bezirks Arnsberg.' Iserlohn, 1857, pp. 112 ff. Hasse, C. L., 'Die Eisenerzeugung Deutschlands.' Leipzig, 1836, p. 169. (Today, all the Müsen mines are abandoned.)

[4] *Op. cit.*

[5] Eversmann, F. A. A., 'Uebersicht der Eisen- und Stahl Erzeugung auf Wasserwerken . . . zwischen Lahn und Lippe.' Dortmund, 1804, p. 42.

stances thus combined to permit a small scale, economically backward and unstable industry which covered the hills of the Siegerland with the rubbish fans of small abandoned mines. The redeeming features of the system were, according to Banfield, its effects on the character of the miner himself: "there is a friendly manner about the Siegen miner, united with all the shrewdness of a man eternally speculating. . . . Poor as the wages are . . . yet there is nothing of that gloom and despondency in the looks of these miners that is so often met with in England" ("M" pp. 75–6). As so often happens, a backward form of economic organization was seen to have distinct social advantages. That the industry survived at all in these circumstances was due to the fact that the mines were not commercially independent but were worked to provide ore for the Siegerland iron industry, frequently by miners who were themselves share-holders in a furnace. Under such a system, it was not essential for each mine to make a profit and, according to Banfield, if the various districts are considered as a whole, only Müsen, with its larger mines, did so. In the centre and south, the profit from the few efficient mines was about balanced by the losses of scores of mines, which were worked only when their owners had nothing more urgent to do.

The iron industry.—The Siegerland iron industry found its raw materials and power in the natural resources of the country, the ores, charcoal from the forests, and power from the rivers. Ties between furnace, forest and mine were not only economic but personal: the furnaceman frequently had shares in a mine, from which came the necessary ore, and a share in the *Hauberg*, which provided his charcoal. The usual Siegerland form of economic organization was followed. A furnace was owned by a number of share-holders, each of whom had the right to use it for smelting his own ore with his own charcoal for one or more days, in proportion to his share holding. With so many persons to be consulted before any change in arrangements could be made, it was not a system of management that led to rapid adaptation, to economic or technical changes. The blast furnaces were about 20 feet high, encased in a masonry tower, into which arches were pierced to give access to the tapping hole at the front and for the bellows at the side. The hearth, lined with refractory sandstone, was roughly rectangular in cross-section, although others, round in section, began to be used from the 1840's. The maximum width was 6–10 feet across the top of the boshes. The bellows were frequently still of leather, some 15 feet long, and were worked by the Siegerland streams alongside which the furnaces were found.[1] Banfield describes how the furnace at Eiserfeld stood within a large casting-house, surrounding which each of the share-holders had, to store his materials,

> "two sheds, one for his ore, and another for his charcoal; and the curious appearance of all these irregular wooden constructions, huddled round the furnace and blackened by its smoke, forms an object perfectly suited to the mysterious gloom of old mining-legends. Here, then, through the long winter, . . . the villagers sit breaking up their ore with hand-hammers" ("M" p. 99).

Obviously Banfield found the *Eiserfelder Hütte* more impressive in its picturesqueness than in its efficiency.

The Siegerland furnaces were of two kinds, the "steel" furnaces producing *Spiegeleisen*, and those producing normal forge and foundry pig iron. Each type was of about the same size, but the "steel" furnaces had a lower throughput, about

[1] Eversmann, *op. cit.*, pp. 23–31. Beck, L. 'Geschichte des Eisens.' Braunschweig 1891–1903, Vol. 2, pp. 187–91.

$2^1/_4$ tons in 24 hours, against 3 for iron furnaces.[1] Eversmann, writing in 1804, stated that for 1 ton of *Spiegeleisen*, 2·7 tons of ore and 1·8 tons of charcoal were necessary.[2] While the availability of water power determined the immediate location of the furnaces, the attraction of ore, the heavier of the raw materials, is clearly shown in their regional distribution (Fig. 3). The principal group of "steel" furnaces was found in the valleys of the Ferndorf and other streams in the Müsen district, from which they drew the highly prized "steel-stone." The furnaces in the centre and south of the Siegerland, drawing on the mines of the Gosenbach–Eisern district, produced exclusively iron for the smiths and, to a lesser extent, for foundry purposes. This was mainly true also of the Heller and Daaden valleys, which had also a few "steel" furnaces, and some which produced both types of iron.

The pig iron of the districts of the Siegerland which lay outside *Kreis* Siegen was mostly sent away for processing, either to the Siegen smiths or directly to the smiths of Berg and Mark, on the northern fringe of the Rhine Uplands. The pig iron (5600 tons in 1837) and *Spiegeleisen* (2400 tons) of *Kreis* Siegen itself passed to the local iron and steel hammers, as had indeed been obligatory under the Nassau régime. They were worked by water power, so that, like the furnaces, they were situated on the streams, above all on the Ferndorf from Kreuztal to its confluence with the Sieg, and on that river from Tiefenbach to Siegen itself.[3] The hammers, like the furnaces, were owned by share-holders who had the right to use the installations for a period of days proportionate to their share. Because of the shortage of fuel, iron processing normally finished at this stage; the bar iron was then sent to the smiths of Berg and Mark, who were able to draw on the coal of the Ruhr valley for fuel.

More famous than the bar iron manufacture was the production of crude steel from *Spiegeleisen*.[4] The greatest centre of steel hammers was in proximity to the "steel" furnaces of the Müsen district. A second group was on the Asdorf above and below Freudenberg, where, however, iron smelting was extinct. The further processing of steel had, by Banfield's time, been lost to districts with better fuel supplies. The crude product was sent to Berg and Mark where "when split into strips and alternated in certain proportions with bar or decarbonized iron it makes shear steel, as the blister steel of Sheffield does when treated in the same manner" ("M" p. 68). The Siegerland was thus obliged to remain a basic producer, using its limited charcoal to transform its iron ore into bar iron or crude steel, in which form it could be transported to manufacturing districts more favourably endowed with fuel, especially coal. What was true of iron and steel was true also

[1] Beck, L., *op. cit.*, Vol. 3, pp. 841–4.

[2] Eversmann, *op. cit.*, p. 26.

[3] The Siegerland iron finery was characterized by the use of only one hearth and only one heating of the pig iron in the production of the malleable iron demanded by the smiths, whereas in most other parts of Germany, as in the charcoal forges of England, two stages, finery and chafery, were necessary. This simple process was made possible only by the freedom from impurities of the Siegerland ores, and its brevity was a great advantage in economizing the scarce supplies of charcoal.

[4] The process was almost equal in simplicity to iron finery, and took place on a similar shallow open hearth. The charge, however, was never puddled, and was always protected by a covering of slag from the direct effect of the blast. The presence of manganese in the *Spiegeleisen*, and the small proportion of impurities, allowed, with careful management, a considerable degree of refining to be achieved without reaching the stage at which decarbonization would convert valuable steel into wrought iron. It took three men about eight hours to produce $3^1/_2$ cwt. of this rather high carbon steel, with a loss of 25 per cent. of the iron on the process. See Eversmann, *op. cit.*, pp. 44–54. Beck, *op. cit.*, Vol. 2, pp. 201–20, 246–61.

of non-ferrous metals, which were cleaned and concentrated at stamping mills powered by Siegerland streams, frequently smelted at local furnaces, but sent away for subsequent processes.

All these stamping mills, washeries, furnaces and hammers followed one another in the smoke-filled valleys of the Sieg and its tributaries, which contemporaries compared with England's Coalbrookdale.[1] On many days of the year, however, the hammers would be still and the furnaces cold, the sign of a system of minute State regulation of production which itself reflected both the acute charcoal shortage and the mercantilist ideas of the German princes. From the sixteenth century the erection of new furnaces and hammers had been forbidden, and the number of such establishments had decreased. Those that were privileged to remain were allowed to work on only a limited number of days in the year: for example, the furnace at Eiserfeld was entitled to work 125 days of 24 hours in the year. Hammers were normally allowed to work for 240 days. Because of their noise, working was forbidden at night, ineffectively it appears, and restricted on Sundays and feast days. Working ceased completely for six weeks in late summer and for a month at mid-winter, ostensibly owing to low water. The restrictions were confirmed by Prussia in 1830, as far as works using charcoal were concerned.[2]

Based though these restrictions were on the shortage of fuel, they were maintained in an effort to keep iron prices high by reducing supply. In the absence of a complete monopoly, such policies could only end in stimulating rival producers, against which the Siegerland industry could not compete, weakened as it was by the local characteristics of smallness of scale, divided control and lack of capital. By the 1840's the local ore began to be sent to furnaces built just beyond the Siegerland boundary, and English iron undersold the local product in Siegen itself ("M" pp. 92–3). The charcoal industry was clearly in decline when Banfield described it; it was soon to die out with the growth of coal smelting in the Ruhr, at which time the system of regulations supposed to protect it fell naturally into disuse. The decline in demand for charcoal in its turn struck an eventually mortal blow at the *Hauberg*, and thus at the close interdependence of industry, forestry and agriculture that was characteristic of the Siegerland.

Peasants, villages and towns.—The intimate linkage of agriculture, forestry, mining and manufacturing that was typical of the Siegerland was reflected in the yearly round of its peoples. As Banfield wrote:

> "The peasants . . . are almost all share-holders in the forest companies. . . . They are besides nearly all miners, and hold shares frequently in one or two iron foundries. In winter the mines are worked and charcoal is burnt for the following 'campaign' at the blast-furnace. In consequence of this arrangement, which leaves them time in the spring and autumn to attend to their meadows, while the short summer is devoted to field tillage, the year is filled up in a manner suited to the habits, and which formerly was equally subservient to the interests, of the villagers" ("A" p. 125).

The Siegerland villages, many of which remain much as Banfield saw them, are situated almost without exception in the valleys, near the cultivable land (Fig. 2). As usual in a country of open-field cultivation, farms are concentrated in the villages, which are thus "an assemblage of diminutive farm-yards, where the dung heaps . . . subdivided like the land they are destined to fertilize, are reproduced at

[1] Eversmann, *op. cit.*, p. 20.

[2] Prussia. Ministerium des Innern. 'Hütten- und Hammer-Ordnung für gewerkschaftlichen Stahl- und Eisenhütten auch Stahl- und Eisenhämmer in Lande Siegen.' Berlin. 25 January 1830.

every house" ("A" p. 92). The houses are lime washed, "the wooden frame . . . left conspicuous all over, and . . . often painted in fanciful colours" ("A" p. 95). Living space, barn, stall and stable are all under one roof. The village community of Banfield's time still retained much property in the form of common land, church, school, mill and bake-oven. Participation in the management of this property, in the ordering of the common fields, and in the forest, meadow and other companies brought to the peasant, as well as material advantages, a sense of responsibility, of having a real stake in the land. Banfield, like many British travellers of the time, was raised to almost excessive heights of enthusiasm by the contrasts between the conditions of the free peasants of the Rhineland villages and those of the landless labourers of post-enclosure England. The German system would, he thought, "secure to the people many of the advantages which they hope, by what are called socialist or communist unions, to attain, without exposing them to the dangers which these innovations threaten" ("A" p. 91).

In the centre of Siegerland stands its capital and chief town, Siegen, on an easily defended hill site which descends steeply on three sides to the Sieg and its tributary the Weis. The description of the town can again be left to the traveller's own words:

> "There is scarcely a town in Europe that presents so extraordinary and antiquated an appearance as Siegen: between two large castles that are picturesquely relieved with fantastic towers, the diminutive houses of the citizens, with gables turned to the streets . . . are lost in a maze of narrow, ill-paved streets that are half choked up with dunghills. . . . It is scarcely possible to conceive that this is the chief town of a district inhabited by the most intelligent and industrious population of the Continent" ("M" p. 88).

The Siegerland since 1850.[1]—The old Siegerland industry declined with the movement of the iron industry to the Ruhr coalfield; the new one grew when, after the completion of the railway from the Ruhr to Siegen in 1861, the new fuel could be carried even into these upland valleys. Iron mining reacted to the new railway outlet by concentration into far larger and fewer units, and by greatly increased production, the greatest annual output, 2·6 million tons, being reached in 1913. Since then the industry, faced with the problem of mining thin veins of ore at depths now approaching 4000 feet, has declined, despite various subsidies, and today production is only about $1\frac{1}{2}$ million tons a year. The metal working industries in the Siegerland have, as in many older industrial regions, survived only through a concentration on processes in which large-scale techniques are not normally employed and in which highly specialized management and workmanship are demanded. Iron and steel in large quantities can be produced much more cheaply in the Ruhr than in the hills of the Siegerland, so that of the new coke smelting plants set up in the latter half of the nineteenth century, only three remain today, and these tend to concentrate on production of special quality steel. There are also six very small blast furnaces, successors of the old charcoal industry, which produce special cold blast iron from local ore for the foundry industry. In the further processing of iron and steel, two branches characterize the Siegerland, the re-rolling of Ruhr steel to produce fine sheet, and the casting from local iron of

[1] By far the most complete account of the economic geography of the Siegerland is Kraus, T., "Das Siegerland: ein Industriegebiet im rheinischen Schiefergebirge." (*Forschungen zur deutschen Landes- und Volkskunde*, Bd. **28**, Heft 1. Leipzig, 1931). For a more recent treatment see Fickeler, P., "Das Siegerland als Beispiel wirtschaftgeschichtlicher und wirtschaftsgeographischer Harmonie." *Erdkunde*, Bd. **8** (1954).

heavy rollers for the metallurgical, paper, food and other industries. Foundries and rolling mills frequently occupy the sites of the old hammer works. Their products are much used in the local engineering industry, whose manufactures include rolling mills, machine tools, railway equipment and all articles made of sheet steel, from boilers to cooking pots. Light engineering and the manufacture of consumer goods are lacking, but the establishment of the Siemag typewriter factory in 1948 helps to give a better balance to the industrial structure. All the industrial plants are crowded into the valleys, especially that of the Sieg, with its railway line, between Kreutztal and Siegen. Today old Siegen on its hill, rising slowly from its war-time ruins, looks down on valleys packed with mills and houses, where once a few furnaces and hammers stood isolated among the green water meadows.

With the end of demand from industry for charcoal and tan-bark, the *Hauberg* system fell into a slow decline. If the woods had been in private or in State ownership, it is doubtful if any coppice would now remain, but the conservatism of the forest companies kept the system going long after it was economically justified. As the oak saplings grow into full-sized trees or are replaced by conifers, the proportion of the forest area in *Hauberg* has declined from 80 per cent. in Banfield's time to about half today, and this process is likely to continue. The total area of forest is also being reduced by the transformation of *Hauberg* into pasture land, and by its use for housing development. As the uniform dark green of the spruce covers the hill sides, the irregular patchwork of the *Hauberg*, characteristic for centuries of the Siegerland landscape, is disappearing. Only the meadows remain much as they always were, except where lost to industry or polluted by its waste products. They alone survive from that closely regulated and integrated economy of *Hauberg*, meadow, tannery, mine, furnace and hammer, which Banfield knew.

Acknowledgements

The writer wishes to thank all who helped his investigations in the Siegerland, especially Dr. Paul Fickeler, Dr. Wilhelm Guthling of the Stadtbibliothek und Heimatmuseum, Siegen, and Professor Theodor Kraus. Also the Directors and Staff of Messrs. Achenbach Söhne, Buschhütten, and of Erzbergbau Siegerland (Grube Neue Hardt). Responsibility for the accuracy of all facts and statements remains, of course, his own.

AN EAST COAST SURVEY: SOME RECENT CHANGES IN THE COAST OF EAST ANGLIA

W. W. WILLIAMS

THERE ARE MANY parts of our coastline where changes, due to erosion or deposition, are rapid and obvious; these are often matters of some concern to the local inhabitants, and are well known to those who study the coastline. Usually, however, the knowledge of the local inhabitants is vague and exaggerated, for the simple reason that it is not based on any proper measurements of what has taken place. More often than not the only reliable measurements available are the widely spaced (in time) surveys of the Ordnance Survey or of the Hydrographic Department of the Admiralty.[1] While these surveys are of the greatest value they are, for obvious reasons, insufficient for complete understanding. They occur too rarely; the scale, especially of the hydrographic surveys, is often too small, and the practical difficulties of making precise surveys are considerable where the foreshore is regularly covered by the advance of the tide. These surveys are to be regarded, therefore, as occasional (though authoritative) glimpses in a long story. They make no attempt to explain how the changes came about, whether as a result of one or more catastropic events, or by slow but progressive stages. This cannot be known unless attention is focussed more closely, and observations are made more often. There is, therefore, a large and fascinating field of research open to those who can make these more detailed and more frequent surveys, and, at the same time examine the hydrodynamic processes which must be responsible for what has occurred.

Between Covehithe and Kessingland, in Suffolk, erosion is taking place at one point at an alarming rate, while, less than a mile away, the coast is building up. In the vicinity there are features above and below mean sea level which, instead of going in the direction common to east coast features, are moving in exactly the opposite direction. These circumstances came to my notice in 1950, when I had completed a series of observations in the laboratory, and on tideless beaches of the Mediterranean, and had come to some general conclusions about wave action.[2] I was then looking for a suitable place to continue my researches on a coast in tidal waters, and was therefore most interested and grateful when Professor Steers directed my attention to this particular place.

In 1951 I began the series of observations which are briefly described in this paper. The object of the research has been to record the rates of erosion and deposition systematically, and to discover as far as possible the agencies which are causing the changes. It is tempting to go further, and to predict what will happen, and one is frequently asked what can be done to prevent the erosion that is so obvious, and so serious to the landowners. In this case prediction is not difficult; but the remedies, sea defences, are the province of the engineer. It is thought, however, that systematic surveys of coastal changes are of great importance. Few such observations are known to exist, and I am sure that there is a great need for other surveys of this kind to be made round our coasts. If we in our generation

[1] The River Boards are now recording changes in the coastlines within their jurisdiction, so that in future the information will be more complete.

[2] "The formation and movement of land bars by wave action." C. A. M. King and W. W. Williams, *Geogr. J.* **113** (1949) 70–85.

cannot interpret them aright they may be of use to posterity who should be wiser than we are. I am grateful to the Nature Conservancy for a generous grant which has made it possible for me to pay frequent visits to this piece of coastline, and to make surveys when necessary. The surveys were carried out on the coast between Kessingland and Covehithe Broad, a length of three miles lying about midway between Lowestoft and Southwold.

At the southern end is a line of cliffs up to 40 feet in height, see 6–10 on Figure 1. They consist of soft glacial drift, mostly fine sand, but with a small quantity of shingle, probably about 1 per cent. After a cliff fall the material lies at a slope of about 45°; this angle steepens as the foot is cut back by wave action on the relatively rare occasions when the waves reach the cliffs; at such times erosion is very rapid. The drift overlies a more resistant formation much resembling the clayey Chillesford Beds; the level of this, where it appears, is near that of high tides, see Figure 2. The northern two miles consist of a sand and shingle beach backed by low dunes, the Kessingland sea wall, and, since the floods of 1953, by artificial banks of the beach material pushed up by bulldozers. A notable feature is Benacre Ness now about one mile south of Kessingland, a large crescent of sand and shingle about $1\frac{1}{4}$ miles long, and with a maximum width of 1100 feet (see Plate 1). Lowestoft, the easternmost point of the British Isles, is 5 miles to the north, and to the east and north-east are the Barnard and Newcome shoals, constantly moving. They lie near the approaches to Lowestoft, so that frequent hydrographic surveys are necessary, and channel buoys have often to be moved. At least eighty-three surveys of varying magnitudes have been made in these waters since 1865. The tidal range is about 6·5 feet at springs and 3·5 at neaps. It soon became apparent that the area was subject to most complex and fascinating geomorphological changes. Not only do the sandbanks move, but the coastline itself has shown remarkable changes. Since

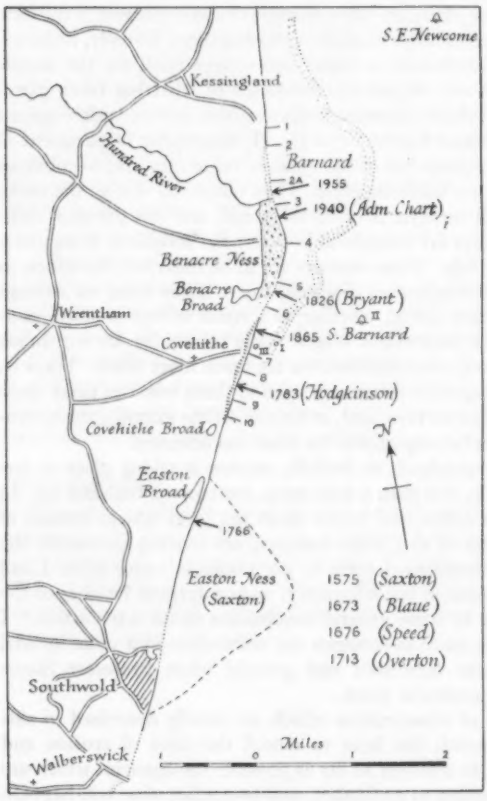


Figure 1

the survey of 1925 whole fields with blocks of buildings have disappeared into the sea; during the night of 31 January–1 February 1953, the cliffs were eroded to a depth of 90 feet over a short distance; but, what is more remarkable, the coastwise movement of eroded material is northwards, whereas one would expect it to travel in exactly the opposite direction.

Examination of the Admiralty Chart of Tidal Streams indicates that mean result of tidal streams and non-tidal currents is south-going.[1] It is this condition which explains the configuration of the mouths of the Humber and Yare to the north, and the Alde to the south. It is therefore surprising to find that in between these well-known features there exists this considerable Ness which is moving steadily in what appears to be the wrong direction. Figure 1 shows that the process has been going on for hundreds of years. According to Saxton, Easton Ness, 4 miles to the south of the present Benacre Ness, was a considerable feature in 1575 and it is believed that when it was eroded a whole village went with it.[2] Speed and Blaue seem to have accepted this position, as presumably did Overton in 1713; but Hodgkinson in 1783 found it less than half a mile south of Covehithe, while Bryant plotted it opposite Benacre Broad in 1826. Since then it has progressed steadily north, and my own surveys since 1951 confirm that the process is still going on.

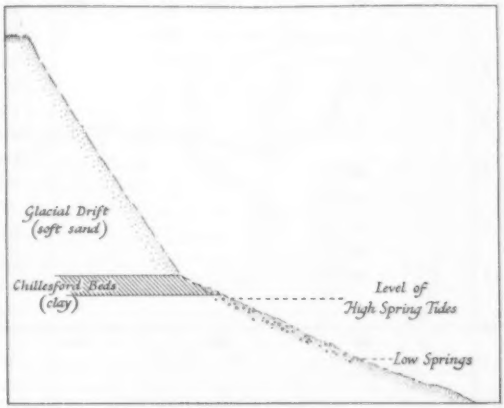


Fig. 2. Typical section of cliffs at Covehithe

At a first glance the Ness appears to have a much larger shingle-to-sand ratio than the cliffs from which it almost certainly derives; in the cliff, the shingle appears in rare and narrow bands, while superficially the Ness is predominantly of shingle. But this appearance is deceptive, and is not borne out by sampling. The samples vary erratically but they indicate that about 1 per cent. of the cliff material is shingle, and the rest sand. On the Ness the material is sorted, and the shingle, which is very obvious on the surface, overlies a great thickness of almost pure sand. Samples taken to a depth of 2 feet showed that the shingle-to-sand ratio was little higher than on the cliff.

[1] Vide 'Atlas of tides and tidal streams British Islands and adjacent waters.' 4th edn. At Smith's Knoll, 52° 43′ N., 2° 17′ E., the residual current is 2·6 sea miles per lunar day, in a direction 135°.

[2] Vide Suckling, 'History of Suffolk,' 1926: "Easton lies Northward of Southwold, and is supposed to have terminated in a lofty promontory, which has, ages since, been wasted by the sea. To have formed the most eastern headland of our island—which it undoubtedly once did—the extreme cape must have extended more than three miles from the present cliffs into the ocean . . . The ravages of the ocean appear to have commenced here at a very early period, for at the time of the Norman Survey, Easton was an impoverished and wasted village."

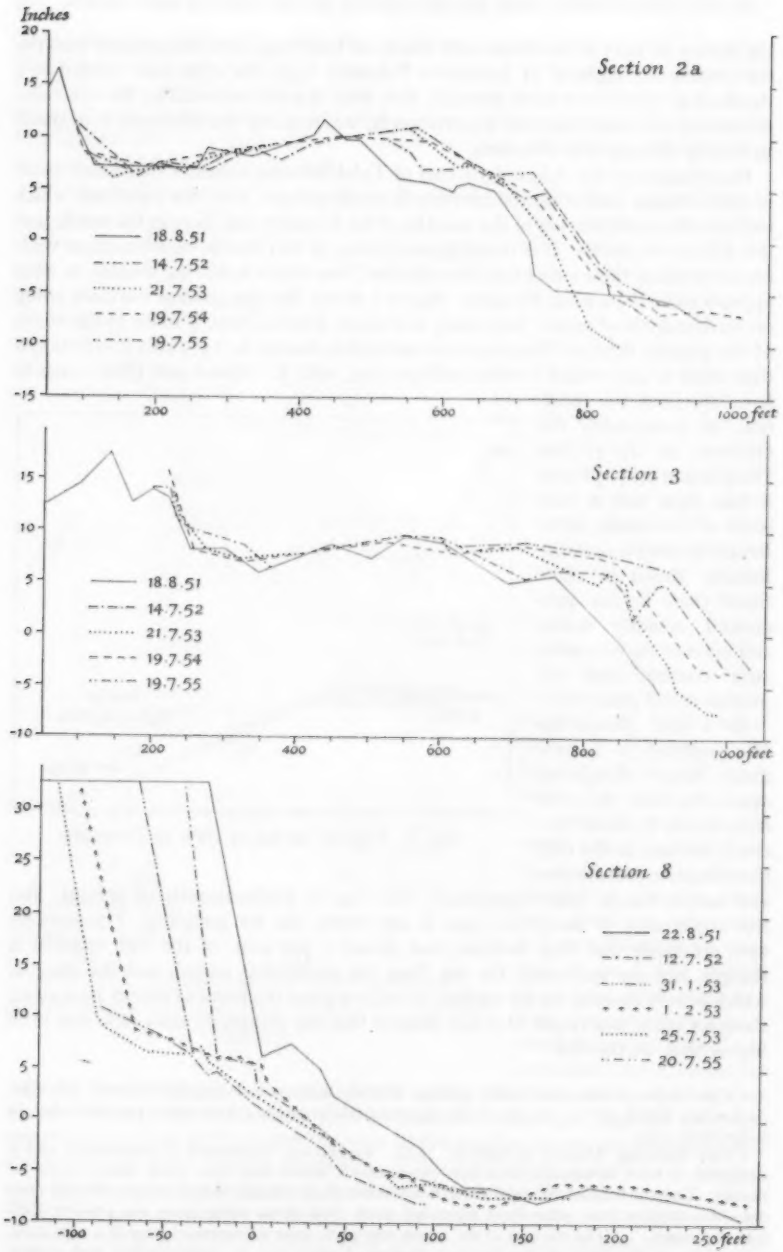

Inches
Section 2a
18.8.51
14.7.52
21.7.53
19.7.54
19.7.55
1000 feet
Section 3
18.8.51
14.7.52
21.7.53
19.7.54
19.7.55
1000 feet
Section 8
22.8.51
12.7.52
31.1.53
1.2.53
25.7.53
20.7.55
250 feet

Figure 3

The programme of investigations as planned was modest and simple, but even so it has not proved possible to complete it. Our aim was to make surveys which would record changes in the coastline and to observe, as far as possible, the conditions of wave and current which caused the changes, and thus attempt an explanation of the agencies of erosion and deposition that are at work in the area.

Surveys.—The coastline was resurveyed in 1951, and its position plotted on the 1/2500 Ordnance Survey showing the 1925 survey. Simultaneously marks were put in and fixed both horizontally and vertically at 11 points along the beach, and sections were surveyed periodically at these points.[1] Figure 3 is a reduction of a few of these sections and they are representative of profiles both on the Ness and on the cliff. They were surveyed with some care, and are intended to reveal vertical changes of about 0·5 foot. One of the difficulties in surveying successive sections has been to preserve reference marks on or near the beach. The ground is very soft, and when erosion has been rapid, iron pipes 3 or 4 feet long have been washed away overnight; on the other hand, such pipes driven to such a depth that only an inch or two was above the ground, have been covered by blown sand, and it is surprising how frequently on this comparatively deserted coastline, marks have been uprooted by people who were either malicious or thoughtless. The sections can be used to determine the advance or retreat of the coastline, and Figure 4 indicates how the high water level has moved since 1951.[2]

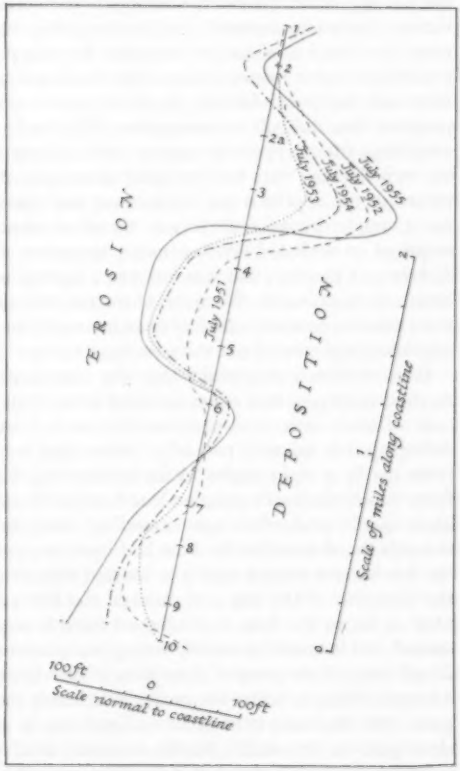


Figure 4

Until 1954 the sections were continued to a depth of about 6 feet below the level of low water of the day on which the survey was made. Distances were measured

[1] At first sections were thought to be the most useful method of recording changes in features of this kind, as long as sufficient of them are plotted. In this survey there are about four to the mile. Ideally there should have been twice as many, but with the resources available it would not be possible to ensure that so many could be surveyed regularly.

[2] This diagram shows the high-water level which is a continuous feature; it does not show the rate of movement of the top of the cliff in the south which in places has retreated much more rapidly than the beach as a whole.

with a chain, and heights were observed with a level and staff down to the water level. The level of the water was ascertained by levelling, and depths below this were measured by an observer who waded in with a 6-foot pole, the distances being again ascertained by direct measurement with a chain. By 1954 it became apparent that the sections were not carried far enough to seaward, and that the coastwise movement of material was not confined to the zone of the sections; for instance, the cliff fall during the storm of 31 January–1 February (totalling about 300,000 tons) did not appear on the beach sections; it was therefore necessary to continue observations further to seaward. In July 1954 they were surveyed to a depth of below mean low water of about $2\frac{1}{2}$ fathoms. For this purpose soundings were made with a leadline from a rowing boat to which an outboard motor was fitted. The results were only fairly satisfactory; the boat was too small for comfort, and being underpowered was difficult to manoeuvre. With only unskilled leadsmen available the soundings often appeared suspect and unlikely to yield the accuracy of 0·5 foot we were looking for; but the chief drawback of the leadline method is that the record of the depths is not continuous, and consequently a bar, or the least depth on it, might be missed. It was therefore most fortunate that my Department acquired an outboard echo-sounding apparatus at this time. It is manufactured by Kelvin and Hughes, and was fitted to a 19-foot fishing boat hired from Mr. Roger Smith of Southwold. We were fortunate, too, that Commander D. Fryer, O.B.E., R.N., who for several years had been interested in this work and had helped with it, organized and carried out the sounding survey.

It is obviously important that the soundings should be carefully fixed. The method employed was to set up large white flags as transit marks for each section (one of these was semi-permanently marked and fixed by resection from well-defined points inland); two other white flags set up 100 feet on either side of the front mark, at right angles to the transit line, formed a subtense base of 200 feet from which the boat's position was fixed, at frequent intervals, by a single sextant angle as she proceeded, echo-sounding, along the transit line. All lines were run towards the shore after the boat had been stopped and "fixed" at the outer end of the line by two sextant angles to charted objects ashore—this outer fix determined the direction of the line and checked the first subtense distance. This method is ideal as far as the boat is concerned since it requires a minimum of trained personnel, but it needs an unduly strong party ashore if delay is to be avoided. It was found that a shore party of three men (even when they were at the surveying ground a couple of hours before the boat) could barely move the marks fast enough to keep pace with the boat; it must be realized that in addition to erecting the marks the shore party is responsible for the necessary tidal observations. Plans are in hand to improve this technique so that manpower can be reduced and the rate of progress increased. Nevertheless, it will probably be on similar lines, for the usual hydrographic method of fixing by two simultaneous sextant angles demands a higher degree of skill in observing (for such large-scale work) than is likely to be available.

The sounding apparatus is capable of recording depths of an accuracy of 0·25 feet in shallow water. It is not to be assumed, however, that the soundings as plotted are reliable to this high degree of accuracy, for there are many ways in which errors can creep in. With the transmitting and receiving unit fastened to the gunwhale rather than near the keel it is obvious that the rolling of the boat will affect the trace by exactly the amount of the rise and fall of that part of the apparatus. So far it has been possible to work on days which were so calm that this movement was rarely more than 1 foot, and no appreciable error has been caused; but it may not

always be possible to work in such favourable conditions. There is obviously also a loss of accuracy if the water level at the time of survey is not accurately known. Plans for erecting tide poles on the pier at Southwold, or on the groynes at Kessingland were abandoned because both places are outside the area of the survey, and it would have required the continuous attention of one man to make the necessary observations. Instead, lines of levels were run from the nearest temporary bench mark, usually on the section itself, to the water's edge as the survey proceeded. The exact mean level of the water is of course obscured to some extent by the lop of the waves at the water's edge, but there is reason to believe that any error so introduced was very small. The accuracy of the observations was tested by plotting the surveyed heights against time, and by comparing this curve with the predicted tidal curve based on the Admiralty Tide Tables. In all cases the agreement was very good, and it is believed that in consequence the contours of the sea bed represent true depths to within 0·5 foot.[1] It is of course important that the contours should be as accurate as possible because a very large cliff fall, when spread evenly over a large area of the sea bed, will alter its relief by very little. It is unfortunate that this detailed survey of the sea bed was not made earlier, because obviously it is of great importance; the single survey of 1955 is of itself of little value, but a succession of such surveys should give a complete account of the movement of material from the time of its removal from the cliff up to its deposition on the Ness.

Current observations.—As opportunity occurred current observations were made in the hope that the anomaly of a northward travel of beach material might be explained. The local fishermen confirmed what was already understood from the records of the Hydrographic Department—that the stream is south-going for most of the flood tide and north-going for most of the ebb tide (actually the directions change about an hour after high and low water by the shore); it was thought, however, that systematic observations might disclose a local predominance of the north-going over the south-going stream. I have referred to the northward movement of the Ness, but this is not the only feature which is moving in that direction. By kind permission of the late Hydrographer I have scrutinized the various editions of Admiralty Chart 1543. Eighty-three editions of this chart have been published since 1865, and of these, thirteen show considerable changes in the banks. These are dated 1865, 1872, 1879, 1884, 1895, 1903, 1906, 1909, 1922, 1929, 1931, 1945 and 1950. On Figure 5 an arrow indicates the direction and distance of the movement of a bottom feature—usually a small sandbank; intervals during which the movements shown by the arrows have taken place vary, but average six years. These movements were plotted by comparing positions of these features on a chart of a given survey with one of an earlier date. Twelve such comparisons were made, and Figure 5 is the result. The conclusions are not infallible, as the identity of small banks is open to some doubt; some of the arrows may well be misleading. There does seem to be clear evidence, however, of a fairly widespread northerly movement. It was this diagram which suggested that the configuration of the coast might affect the water circulation south of Lowestoft and cause an almost perpetual eddy which was north-going inshore. It seemed possible that the south-going flood stream might be directed to the south-east by the flat headland at Lowestoft, thus causing a north-going compensatory eddy inshore; the north-going ebb, where the stream in the offing changed, would run northwards without interference; indeed the arrangement of arrows on Figure 5 suggests some such phenomenon. The longshore fishermen are of course interested in the water

[1] The contoured chart is not published with this paper.

currents because they affect the working of their trawls, and in discussion with them it became apparent that while their knowledge was true in general, it seemed in some respects to be incomplete; they were unable to determine the exact balance of the tidal streams because they do not fish during storms when the longshore currents are likely to be at their strongest.

With the object of testing the eddy theory a programme of current measurements was begun in July 1952. The first observations were made by Commander Fryer from a 14-foot boat at anchor, using a vertical bamboo pole 12 feet long. To this was attached a light line marked in feet. First intentions were to use a current meter within a foot of the bottom, but since, during times of maximum erosion, the silt and sand are in suspension from top to bottom it was thought that there was some value in the simpler kind of observations, especially as the reversals of current associated with wave action could not occur at the observing stations chosen.[1]

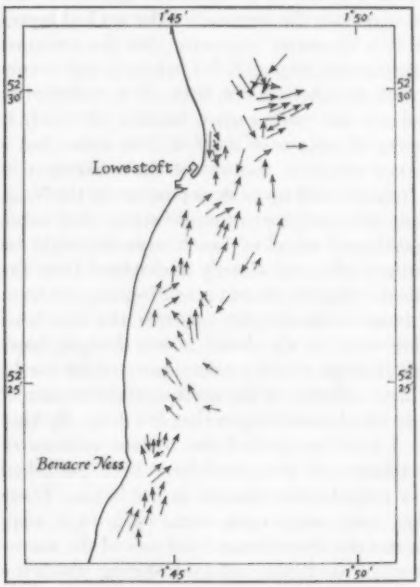


Figure 5

The observations from the boat.—Generally, readings were taken at half-hourly intervals during observing periods, but these periods were confined to daylight hours and were really too short, never exceeding ten hours.

Admiralty charts 1543 and 102 show tidal stream stations (F) 52° 28·4′ N., 1° 46·6′ E. in the Stanford Channel to Lowestoft, 5½ miles north of Benacre Ness and 1¾ miles from the shore, and (A) 52° 45′ N., 1° 53′ E. off Sizwell, 8½ miles south of Benacre Ness and 6¾ miles from the shore. At both these stations the durations of the north-going and south-going streams are approximately equal. The eddy, if it existed, obviously lay shorewards of the line joining these positions and so the first station occupied was the south-east Newcome buoy which lies about 2½ miles north-east from Benacre Ness. Observations here were started about one hour before high water by the shore and continued until about five hours after, and showed the stream running southwards until about half an hour before high water Dover and then to northwards. The time of the turn and the rate of flow observed agreed closely with those predicted for station (F) and showed that the south-east Newcome buoy was outside the influence of the eddy the existence of which we were trying to prove. Subsequently observations were made at stations I, II, and III, situated on a line of bearing 087° from

[1] This account of the current observations is taken almost verbatim from Commander Fryer's account of the work in the *Journal of the Royal Institution of Chartered Surveyors*, October 1953: "Benacre Ness, an East Coast Coast Problem," W. W. Williams and D. H. Fryer.

Covehithe Church distant from the shore 500 yards, 2000 yards and 200 yards (see Fig. 1). The observations at both I and II fortunately included the full period from low water to high water by the shore and showed in each case a southward-running stream from about 1 hour after low water to 1 hour after high water; thus indicating once more that in these positions the streams were running normally for this part of the North Sea. Our eddy, if it existed, was confined to water very close to the shore, and all remaining boat observations were made at the inner station, No. III.

Subsidiary current observations.—Drift observations immediately offshore were made concurrently with the observations afloat; close south of Benacre Ness near section 4 for the first days and then at Covehithe, immediately abreast of station III while the last four days' observations afloat were being made there. These drift observations consisted of timing the passage of a piece of drift wood (thrown into the sea from the beach) across two pairs of transit marks set up 100 feet apart. These observations were greatly influenced by wave action and by the wind, but nevertheless do give some indication as to what is happening immediately off the beach. In addition, in order that the general direction of the stream at the South Barnard buoy (station III) could be observed from the shore, a 10-foot vertical pole with a brushwood topmark was secured to the buoy by a line about 2 fathoms long. It was hoped that the approximate strength of the stream could be estimated by the angle taken up by the pole. These observations, however, were only partially successful due to the tendency of the 10-foot pole to foul the moorings of the buoy at the turn of the tide. Generally, the direction of the stream changed at the three stations III, II, and Covehithe beach at about the same time—that is, roughly an hour after high and low water by the shore—and no indication of any north-going eddy was found.

The drift observations made at Benacre Ness itself, however, during the first four days' observations do indicate that there the duration of the south-going stream is only about 3 hours in 12. Similar observations made on two days at Benacre Sluice (about ½ mile north of the Ness) also indicated that the duration of the south-going stream close inshore was not greater than 3 hours in 12. There were, however, large variations in the results from day to day, and it would be misleading to attempt any conclusion from these observations. Such observations as have been made indicate that there is no evidence for supposing that the eddy exists; the short duration of the south-going stream at Benacre is still unexplained.

It is relevant here to draw attention to the fact that observations of surface currents in the open sea are extremely difficult and laborious to make, and those of bottom currents, where the bed material is being moved, even more so; this is particularly true during storms when the rate of transport of material is greatest. The ordinary current meter needs constant attention from the observer; when conditions make observations possible this is wasteful of manpower, but during storms observations are impossible. The latest designs of instrument are expensive, liable to damage by silting, and, if of an electronic design, need constant attention. Moreover, even if an electronic instrument were planted before a severe storm the electric cables would almost certainly break in the surf during the storm, or cause the instrument to drag. There is a real need for a self-recording instrument, sand-proof, robust, and capable of recording for ten to fourteen days. Such instruments would need to be inexpensive since it would be desirable to use several at a time at carefully selected stations, and they might well be cut adrift or damaged by trawlers working close to shore. Whether it is possible to make such an instrument or not

remains to be seen; certainly a full understanding of coastal behaviour is impossible without it.

Meteorology.—The daily publications of the Meteorological Office provide an adequate record of weather conditions and, with the broadcast predictions, indicate when conditions conducive to erosion are likely to occur. It became apparent quite early that until a surge occurs, producing an abnormal rise in the water level of up to 5 feet, changes are limited to minor and frequent variations, usually at the back of the beach. But during surges the attack on the cliff occurs. This may happen two or three times in a year; but when it does, the changes are considerable. The importance of meteorological records, therefore, is to ascertain when surges and storms occur, and this is not difficult, especially as local residents and fishermen are able to supplement the official records with their own observations.

Storm effects.—An interesting incident which occurred in the course of these surveys was the storm of 31 January–1 February in 1953, when there was a surge in the North Sea, combined with wave action of unusual violence. It was on this occasion, it will be remembered, that there was much damage and loss of life at many places on the East Coast. On the afternoon of January 31, a Saturday, there was a very strong wind from a little west of north, and during the night it freshened. It was during the high tide of that night that most of the damage was done. The tide level at one time was raised 6 feet above the predicted height. There are no reliable records of wave heights, but they were probably not less than 10 feet in height. This means that the sea reached 16 feet higher than usual at high tide, so that it was working with considerable violence on the cliffs. It was not until the Sunday morning that I learned of the severity of the storm, although I had been on the beach on the Saturday, and was staying within 2 miles of it. This was because power lines had been cut, and there was no wireless news in the area. The sight on Sunday morning was remarkable. Wave crests, very confused and wild, were reaching to the top of the cliff where it was about 12 feet high. The surge was then about probably 3 or 4 feet in height, and surf waves were running over the shingle banks 10 feet above mean sea level into Covehithe and Benacre Broads; the Broads must have been filled with salt water as a result. The erosion on the beaches seaward of the Broads was such that the beds of the Broads themselves were torn out, and large blocks of peaty bed material with reeds embedded in them were strewn to the north and south, but mostly to the north of their point of origin. The cliff was eroded where it is 40 feet high, its highest point, to a depth of 40 feet in places, and at one point where it is only about 10 feet high it was cut back a distance of 90 feet. I estimate that within twenty-four hours 300,000 tons of sand and shingle were washed away from Covehithe cliffs. The pumping station at Benacre Sluice, the outfall of the Hundred River, was wrecked, and the long low river valley was flooded. The marshes of this river valley are very vulnerable to this kind of surge. As can be seen from Plate 2 there are considerable excavations immediately behind the beach where gravel was removed during the war of 1939–45. Should the sea break into these—as it began to do in 1953—the consequence might be grave. The East Suffolk and Norfolk River Board is well aware of this danger, and keeps a watchful eye on the protective embankment that was built after the storm.

General conclusions.—The erosion at Covehithe was almost as well known as that at Dunwich, and it did not need this kind of survey to prove it. The rate of erosion is such that the successive surveys of the Ordnance Survey reveal it quite clearly, but it requires more detailed observations to demonstrate how the erosion is brought about. There can surely be few places where natural conditions combine with such

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1. Benacre Ness from the air: looking north-west

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2. Coast at Kessingland, looking north to Lowestoft

disastrous completeness to cause erosion. The cliffs of soft sand, normally above the beach, the zone of wave action, are attacked by the sea during the not infrequent North Sea surges; at such times wave action is usually severe, and the cliff falls, once they are in the sea, are not left on the beach to augment it and to form a protective layer, but are transported laterally, so that the process of erosion can continue. Except during storms erosion is negligible; the shape of the beach shows only minor changes; indeed, a remarkable feature of most of the sections is the consistency of the slope of the beach between the levels of high and low springs (see Fig. 3).

The surveys demonstrate too (what is well known, but often seems to be overlooked) that it is broken, or surf, waves which are destructive and cause erosion. Unbroken waves tend to push material up the beach. The sections plotted do not demonstrate this point, because only sufficient profiles have been plotted to indicate the damage wrought from year to year, or by individual storms; but day to day observations did, in fact, confirm this simple fact. An interesting and, as far as I am aware, unexplained phenomenon on this coast is that erosion occurs in bites; that is to say, at a given time there may be considerable erosion at a given point, while at a point a quarter of a mile on either side there may be no erosion at all. There is an excellent example of this near Pakefield (see Plate 2). Here erosion is generally severe, but there is one stretch of cliff fronted by a wide beach where, for the time being, there is no erosion. The coastline approximates so nearly to a straight line that the hydraulic action would appear to be uniform all along the coast; there is no evidence that cliff falls have formed protective banks in one place and not in others. It is hoped that future investigations may help to explain why such places are free from erosion.

There remains the intriguing problem of the northward movement of the Ness. How is it that on a coast where movement is well known to be from north to south, this Ness, Easton Ness, less than a mile north of Southwold in 1575, had moved to Covehithe by the beginning of the nineteenth century, and is now steadily moving northwards to confront Kessingland? I have shown earlier that there is no evidence of any unusual water circulation here; the imagined eddy south of Lowestoft almost certainly does not exist, and as far as is known the coastal currents differ little from those to north and south. There is one theory which appears to satisfy all the conditions. It is reasonable to suppose that a northward transport of material occurs during the recession of surges. During the advance of the surge, wave action may well be increasing in intensity; the greatest damage to the cliffs is likely to be at the maximum height of the surge which may reasonably be supposed to coincide with the height of the storm. If we suppose that at this time a large mass of material has fallen, it will come under the action of an abnormal north-going pull as the level of the sea falls, and the water retreats whence it came; it does not go directly to the Ness, but to a point a little seaward of it, and from this position it is at a later stage pushed up the beach (see Fig. 4). It may well be that this is the solution of the problem; confirmation can come only from actual observation here and in other places on our east coast where the beach material is derived from cliff falls. It is hoped that as these surveys proceed it will be possible to confirm this theory, or to find some other explanation of the problem.

DISCUSSION

Afternoon Meeting, 6 February 1956

Before the paper the CHAIRMAN (Professor J. A. STEERS) said: Mr. Williams, who is a lecturer at the Department of Geography, Cambridge, had a good deal of experience as a surveyor before the War and, among his other activities during the War, was very much concerned with landing beaches. Since then, he has worked on various problems connected with the beaches round this country and has particularly interested himself in that part of the Suffolk coast between Southwold and Lowestoft where, as he will tell you, there are interesting problems of erosion and deposition.

Mr. Williams then read his paper

The CHAIRMAN: First I ask Commander Fryer to make a contribution to the discussion.

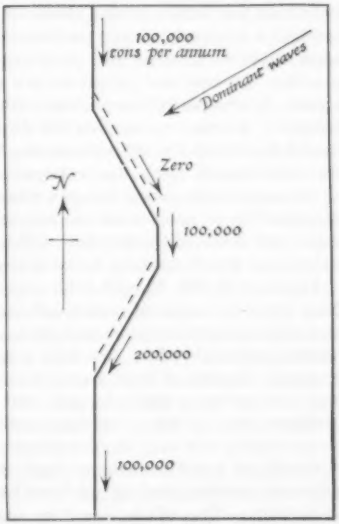
Commander D. A. FRYER (Department of Surveying, Durham University): I have been working with Mr. Williams on these beaches and naturally we go to work in the same way, but I might add a little about technique. We rigged our Kelvin and Hughes portable echo-sounder, rather unwisely, on a plank set athwart the boat, which meant that the effect of the boat's rolling was magnified and gave the very serrated trace we saw on the screen. The Admiralty, when using the portable equipment, place the oscillator over the bow, on the centre line of the boat, where vertical movement caused by rolling is at a minimum. It occurred to me this morning that, next season, we might try supporting the oscillator by a float which would be towed alongside from a small boom rigged from the bows of the boat (it cannot be towed astern because the propeller wash would prevent the echo coming through). If this succeeds, it will have the twofold advantage of removing irregularities from the trace due to rolling (those due to the vertical movement of the waves will, of course, remain) and also of relieving much of the inevitable anxiety when running a rather heavy boat as close inshore as possible, with the vulnerable oscillator sticking down about two feet below its bottom, knowing that one bump might be the finish of all field work for that year. A word of warning about calibration. On first fitting, Messrs. Kelvin and Hughes sent their representative to calibrate the gear and this was done in the river Blyth. Our first day's soundings off Benacre Ness differed considerably from test soundings made with the leadline because sound waves travel through salt water at a different speed from those through the fresh river water. Calibration should be done in the water in which it is proposed to sound—very elementary but easily overlooked.

In the "fixing" of the soundings it might be thought that a qualified hydrographic surveyor might have used a more direct method than this apparently time-wasting setting out of transits and subtense bases. That, I think, is not so; there is much to do in the way of watching the sounding and the steering and so the simpler method of fixing the boat's position is the better. There are other advantages also in the method: plotting is simplified—being merely a distance measurement along the section line; and the transits will enable the self-same sections to be run each year and thus make comparison more valuable. Nevertheless, since we have found that the shore party cannot keep pace with the boat, we shall probably dispense with the subtense bases in future, though not with the transits. Levelling from our nearest known height is a very convenient method of finding the height of the tide, and deciding the exact position of the true waterline when waves are breaking on the beach is not as difficult as it sounds—it must be remembered that we chose calm days for our sounding. We can probably expedite the levelling over long stretches of beach, with many change points, by using tachymetric methods.

I find it difficult to accept the explanation offered by Mr. Williams for the northward movement of Benacre Ness because, if correct, similar northward movement should be occurring everywhere along this coast. You will have noticed also that the diagram showed that after the big surge of 1953, although there was excessive erosion

everywhere, there was no undue building up of the Ness. My own idea (though I am not entirely convinced) is that most of the erosion occurs at times other than those of the surges, when strong onshore winds and waves coincide with the high waters of spring tides; on these occasions the maximum amount of eroded material is in suspension at and shortly after high water and it is then (one hour after high water) that the tidal stream turns and carries this material to the northward. Elsewhere along the coast, at Winterton for example, during the crucial period the tidal stream still runs to the southward. At Dunwich, it is true, conditions are similar to those at Benacre, but the eroded material from the Dunwich cliffs carried northwards by the tidal stream is probably dissipated by the ebb tide running out of Southwold harbour before being deposited. However, as Mr. Williams has said, all will remain conjecture until we can obtain reliable current observations, close to the bottom, in time of storm.

Mr. R. C. H. RUSSELL (Hydraulics Research Station, Wallingford): I was not surprised to hear Mr. Williams speak about his failure to equate the quantity of material lost from a beach with the quantity found to have accumulated elsewhere, even when using his increased length of surveyed line. We at the Hydraulics Research Station, using surveyed lines 2000 feet long, have had similar failure. These surveys of beaches in Poole and Christchurch Bays have been made annually with the object of ascertaining whether, and to what extent, the presence of different types of shore structure influences beach erosion. By repeated surveys we hoped to find whether, for example, erosion was greatest in the presence of a vertical sea-wall, or a sloping sea-wall, or where there was no wall at all; similar information on the influence of groynes was also wanted. Little of value has come out of these surveys because the differences between the occurrences at apparently similar places under apparently similar conditions were as great as the differences between occurrences that could be attributed to the presence of alternative sea-defence works. Investigators in the field of beach changes have nearly all found the same difficulty, namely that the random changes, or to be more exact, the unexplained changes, have been large compared with those that could be explained. A good example of this is some work done by R. L. Wiegel in California. He made some very thorough observations of all factors that could affect the beach: the wave height and period, the direction of wave approach, and the speed and direction of the longshore currents. He also surveyed three closely spaced beach sections every two weeks. The investigation covered ten months. No satisfactory correlation between beach changes and any of the other measured variables emerged from the work, mainly because the changes were not consistent between the three sections.



As regards Benacre Ness moving from south to north, while the other features mentioned by Mr. Williams moved from north to south, those other features are with one exception river mouths. Whereas one would expect a river mouth to move in the same direction as the material reaching it, there is no reason why a promontory should move in that direction—rather the contrary. The case of Benacre Ness can perhaps be explained by the figure shown, which represents a simplified promontory on a straight coast, along which there is a steady drift of material from north to south of

100,000 tons per year. The direction of the predominant waves is supposed to be from the north-east. Along the northern face of the promontory, because it faces directly into the waves, the drift will be zero, and along the southern face of the promontory, because it makes a very oblique angle with the waves, the drift will be greater than normal, say 200,000 tons per year. It can be seen that along the northern shore there will be an accretion of 100,000 tons and along the southern shore there will be erosion of 100,000 tons. Accordingly, the promontory moves northwards.

This is a gross simplification of what may really be happening, but I should be pleased if Mr. Williams would consider its possibilities.

Mr. C. KIDSON (Nature Conservancy): I, too, have to confess partial failure with this kind of experiment. Detailed recording of sections along a beach cannot give useful results in such a very short period of time, and the moral to be drawn is that such observations have to be continued for very much longer than either Mr. Williams or anybody else has hitherto been able to keep them up. Only those who have experience of this type of work can realize that the results of an enormous amount of effort have been put before us this afternoon. When listening to a paper which seems to be tackling a relatively simple problem in a relatively simple way, it is easy to suggest what ought to be done and what might have been done to provide the answer. In practice, the ease and simplicity are deceptive. Resources in man-power, time and money do not permit more than a fraction of the necessary work to be carried out. However, it seems to me that the direction of drift at Benacre Ness could be determined by detailed drift experiments, marking the pebbles of the beach and tracing their movement. Such observations would give useful indications even though much of the movement on our beaches takes place offshore and in times of storm when it is impossible to know what has happened to pebbles between counts. There is great hope that some of the physical difficulties will be removed by the more up-to-date techniques which we hope to be able to put into operation without too much delay.

I agree with Mr. Russell, who suggested that the movement northward of Benacre Ness is not the result of movement northward of beach material. It reflects a change from deposition to erosion, and pin-points the cardinal problem facing all students of beach processes: when and how a beach becomes liable to erosion. Why, at any particular instant of time, does a beach which has been prograding begin to be cut back, or one being washed away, start to build up? Much of our thinking on coastal problems has not taken sufficient note of the fact that erosion and deposition often go on side by side and simultaneously on adjacent stretches of beach.

Finally, it is not possible to understand the processes which are taking place on a piece of coastline such as we have been discussing this evening if it is considered in isolation. The whole coast for many miles on both sides of a beach influences what happens on such a small section. That is not a criticism of Mr. Williams' work. It is, rather, a plea that studies of this nature should be duplicated, so that a far greater proportion of our coast is under detailed examination. The enthusiasm for measuring changes in the coast just after the great flood of 1953 seems to have been dissipated, and we still have little idea of what is happening on much of our coastline. It is often useless and sometimes misleading to be told that people remember that this and that happened on a beach. Only precise measurements of the kind put before us by Mr Williams are of real value. I would like to congratulate him and Commander Fryer on a very heavy piece of work well done.

Mr. N. B. WEBBER (Ministry of Agriculture, Fisheries and Food): I am an engineer who is concerned with the problems created by erosion and sometimes by accretion. I would like, therefore, to speak on the particular problems of the Benacre Ness area. The phenomenon of alternating erosion and accretion is common on the east coast and is particularly evident on the short length of 7 miles between Lowestoft and Covehithe. Pakefield suffers from erosion, and extensive new defence works have been necessary. Between Pakefield and Kessingland, accretion has occurred, and the cliffs, which were at one time being eroded, are now covered with vegetation. At

Benacre Ness there is accretion and again further south there is erosion. The accretion at Benacre Ness is interesting because whilst it is welcome from the point of view of coast protection, it has, nevertheless, in this instance created a problem in land drainage. The small Hundred River discharges into the sea at the Ness and there are early records of a port at Benacre, which is now a small village some distance from the sea. One presumes that at that time vessels passed up a tidal river to the port—no doubt at a later date the outfall silted up and the opportunity was taken to construct a sluice so that the marshes could be reclaimed for agriculture. All this is conjecture and a matter on which the geographers can really speak with more authority. The important fact is, however, that the later northward movement of the Ness blocked the outfall run more and more frequently—clearance was by hand or mechanical means and was inevitably expensive so that finally recourse had to be made to pumping. A temporary pumping station was erected in 1948 and just recently a new permanent station has been completed at a cost of about £50,000. The pumps discharge into an overhead flume, some 200 yards long, which carries the water to within 50 yards or so of the tip of the Ness. It is a pleasant thought that if the Ness continues its northward march as far as Kessingland, there may one day be no longer the need for major sea defences at that point, or for pumping the whole of the discharge from the Hundred River!

In the 1953 tidal surge, the sea breached the dunes in front of the temporary pumping station and also overtopped the beach to the south, the sea pouring into the gravel pits and also into the Kessingland marshes. The remedial measures took the form of clearing away the sand, repairing the pumps and strengthening the dune at the pumping station. There is a proposal also to construct a sea-wall between the Kessingland marshes and the gravel pits, after which the points of entry in 1953 should be effectively sealed. The northward movement of the Ness and the consequent erosion to the south brings the high water mark ever closer to the gravel pits so that at the nearest point it is now only about 25 yards distant. It is interesting to speculate on the later developments in this area if and when the sea enters the pits. There is some divergence of opinion concerning the distance to which groynes should be extended below low water mark. In this respect, it would be helpful to know if the author has carried out surveys of bed material which would indicate the movement of pebbles very much below low water mark. This is just one of the unknowns with which the subject of sea defence is so beset and there is much scope for more research work of the type which the author has carried out.

Mr. D. E. CARTWRIGHT (National Institute of Oceanography): An idea has occurred to me during the enunciation of the situation which I thought might shed some light on it. My idea is based on very quick speculation and may prove on close inspection to be false. We have heard it suggested that whatever is taking place is strongly related to the wave action, and judging by the various irregular spasms in the way this part of the coast does recede and build up, it seems to suggest that it is due to something of a very irregular nature, such as waves and storms. I noticed in several of the aerial photographs of the region that there seemed to be quite marked wave trains being reflected off this coast: one can distinguish both the incoming and the reflected waves. Conditions are not always suitable for this, but I gather that the area is one of uniform depth and with a very steep bank, so that these conditions would be suitable for reflection. If this is so, and the waves are normal to the coast, then it might constitute a bar-building mechanism. I also noticed in some of the diagrams of bars, particularly on the northernmost part of the coast, that there was a strong bar about 600 feet from the cliff and another at 200 feet. This might suggest a half wave length series of bars at the nodal points due to a wave length of 800 feet—a rather long wave to travel far in shallow water, but it might occur at very high tides and when there is a distant storm. Waves would be coming in normally when the wind was in the north-east and thus with maximum fetch, so that one could imagine waves of long wave length coming in and forming these bars by reflection. The bars might protect the

coast from the action of shorter but steeper and more dangerous waves which would subsequently break on them. This, of course, does not explain how material is eroded from the southern part of the coast, but its more easterly facing may be of importance, and also tidal currents. As I said, this is only a quick and ill-considered speculation.

Mr. W. V. Lewis (Department of Geography, Cambridge): As a result of our work on Chesil beach, we have thousands of observations and although the answer is not quite chaos, it is not very far from it. It is possible to get systematic answers in a laboratory in a wave tank, but as soon as you go to the shore you will find the endless variety of nature is such that it seems you must have an extra lease of life in order to straighten out the chaos that a few years' observations bring forward. And may I say that when we produce bars—Mr. Williams and Miss King did most of this work in the laboratory at the Geography School at Cambridge—it is the short, steep waves that in fact produce the break-point bar, not the long ones. We must not say, however, that that happens in the sea; invariably the long waves rub out the break-point bar, and it is built consistently by the short, steep, storm type of wave.

The movement of Benacre Ness is the intriguing point. I was delighted to hear Dr. Russell bring up the point that it looks as if the one section of the shore which is stable encourages aggregation because it very nearly faces the direction of approach of the dominant or prevalent waves in the North Sea, which is, as many of you know, a thesis that I have been preaching for twenty-five years. In this case, it is worth very serious consideration that it is perhaps the relation of the two shores to the direction of wave approach that is fundamental here. One can point to many instances round the British coast which indicate that whenever there is a large stretch of shore facing very closely head on to the approach of the waves, this holds up the drift and encourages deposition. We are very grateful to Mr. Williams for pointing out that undoubtedly there is deposition on the northern part—the aggregating part—of Benacre Ness, and undoubtedly erosion round the corner. Those are absolute facts. Therefore, I think the link-up with what Dr. Russell said is very tempting. We know there is deposition on the shore which faces nearer towards the north-west, and that is what one would expect: a slowing down of the drift where the obliquity of the waves was less, and a speeding up of the drift where, round the corner, the obliquity of the coast to the waves was greater. Further south at Orfordness there is the complete reverse: deposition round the corner and erosion on the shore that faces slightly more north-west. Probably the reason is that the angle at Orfordness is sharper, and the dominant or prevalent north-easterly waves weaken in swinging round to strike that relatively lee shore. That is a point worth looking into on this coast: what angle there must be to encourage erosion or deposition. Frankly, I am glad to hear put forward the question of the relation of shore direction to the prevalent and dominant waves.

Mr. D. E. Cartwright: I was, in my speculation, thinking of nodal-point bars, not break-point bars; nodal-point bars, I know, are not so often observed in wave tanks, but they have been observed by Bagnold in connection with long waves approaching a beach of low density sand.

Mr. L. S. B. Simeon: There is in the North Sea an amphidromic point half-way across to the Dutch coast. This causes the tide range at Covehithe to be, as the author tells us, 6 feet whereas, 20 miles north and south of Covehithe, the range is 12 feet. Has this not something to do with the unusual "Mediterranean" condition that results in the apparent northward drift?

Mr. W. W. Williams: I reply first to Dr. Russell's suggestion that the northward movement of Benacre Ness is explained by a southward movement of material. In stream flow, of course, it is common knowledge that ripples move upstream, and bearing this in mind, Dr. Russell's theory has been considered. It might be the explanation, but I have not observed the south-going material. This evening, I showed a slide taken after the 1953 storm from which could be seen that in the groyne at

Kessingland there were some large pieces of the peat from the bed of Covehithe Broad. That material had, in fact, travelled northwards; and there are other evidences. For instance, the mouth of the Hundred River at Benacre more often than not is sent northwards in the same way that Orfordness points southward. I think Commander Fryer would support the view that present indications are that the material appears to be going north. But Dr. Russell's suggestion is not to be ruled out. The obvious gap in my observations is the determination of coastwise currents, and I am afraid that the problem is unlikely to be solved until these observations are available.

During the War we often heard the rather overworked expression, "I could not agree with you more," and I would like to say that to Mr. Kidson now. One knows that it is not possible to take a piece of coastline such as this and study it as a unit. It may well be that things are going on also at Pakefield or further south, which affect this piece of coastline. The evidence from the sections proves clearly that material is moving into the area from outside and, equally, going from within the area to the outside. With the resources we had at our disposal, we thought it proper to maintain the intensity of observation in the area we started on rather than to spread the observations more thinly over a wider area.

Mr. Webber asked whether I had any views on navigation up the Benacre. I have not, not being a historian. I was surprised to hear recently that craft were at one time navigated up the River Blyth, but it certainly sounds more reasonable than taking craft up the little ditch now known as the Hundred River. How far groynes should be taken to seaward, I do not know. I believe our sections show that the material is moving to a depth of 3 fathoms, which on a gradient of 1 in 100 is a long way out. I do not suppose Mr. Webber wants to carry groynes so far. The groynes at Kessingland appear to be most effective, and as far as I remember they go to the level of low water springs. It is difficult to know what proportion of shingle there is on Benacre Ness: probably there is about 1 per cent., but it varies so accidentally that it is difficult to say what the mean figure is. Certainly there is a great preponderance of sand.

I should like to talk to Mr. Cartwright later about wave action. I think it quite possible that wave action, if properly understood, could explain much of what is going on, for it is obvious that the energy in the waves which run during big storms with their potential for moving material far to seaward, together with the currents or existing tidal streams, provide the motive force. At such a time, there is an enormous amount of material in suspension; the direction in which it is moving much depends upon whether it is in the surf zone or outside it; and the plunge line moves so rapidly with wave height and the state of the tide that the direction of movement changes rapidly. It is important, therefore, to take into account wave behaviour and the coastwise currents, if problems of this kind are to be properly understood. Most unfortunately, it is at present impossible to make such observations accurately over long periods. It may be that the rather surprising northward movement of the Ness can be explained by the aspects of the north and south halves, but, as I have attempted to explain, there is more than a hint of transport of material to northward; further observations may shed more light on the problem.

The CHAIRMAN: I know the east coast fairly well and it always has seemed to me to be one of the best experimental areas for this kind of work. Mr. Williams has spoken in detail of one particular piece of coast between Kessingland and Lowestoft and reference has been made to Aldeburgh. It is quite definite that at Aldeburgh a northward movement of beach has gone on at the groynes. Exactly how that occurs I do not know. Although in general terms I welcome Dr. Russell's view as to the northward movement of Benacre Ness, I think it would be difficult to apply it to Orfordness. It seems most important to relate not only this survey but other work on the coast to the coastline well away from the place being studied. That seems to me extremely important in order to arrive at a right picture and perspective in regard to the particular place being studied.

Reference was made also, I think by Mr. Webber, to the Benacre river. I do not

remember the precise details, but I believe that in the thirteenth century there was a Porte de Benacre and several other ports along that coast. I have always assumed that it was not necessarily a navigable river but a little haven or river beach where boats might be drawn up the beach occasionally. I do not think it was necessarily an actual harbour in the modern sense of that word.

I know you wish me, and it is my great pleasure, to thank Mr. Williams most warmly for his paper which has provoked a particularly interesting discussion. Coastal matters of this sort are now thought about much more than in the past, and the fact that we have had representatives from four or five national institutions to address us emphasizes the importance to the nation as a whole of the subject.

FELIX FABRI'S PILGRIMAGE FROM GAZA TO MOUNT SINAI AND CAIRO, A.D. 1483

G. W. MURRAY

IN A RECENT book, 'Jerusalem journey,'[1] Miss Hilda Prescott has retold the fifteenth century pilgrimage of Felix Fabri, in company with Paul Walther and Bernhard von Breydenbach, to the Holy Land; and, not long ago, she suggested to me that the account in his diary of the further journey to Mount Sinai and Cairo deserved clarification. Enough of the place-names he mentions have survived *in situ* to reveal the way by which the pilgrims travelled; yet their route was certainly devious and might almost be termed furtive.[2] We are ignorant of the boundaries between the north Sinai clans of that age; but, had Fabri made the journey four centuries later,[3] his route is that which a guide from the Tarabin of Gaza might very well have taken to avoid contact with the hostile Tiyaha of central Sinai who held (and still hold) the abundant wells at El Qusaima and Nakhl.

Fabri's caravan included both baggage camels and riding donkeys and, since the normal pace of the former, when laden, is not more than about $2\frac{1}{4}$ miles an hour, twelve hours a day must often have been spent on the march. For they frequently covered distances of 25 or 26 miles and, to allow some time in the afternoons for the beasts to graze, the starts had then to be long before daylight. Thus, for three consecutive days, September 15, 16 and 17, the diary contains the entry "Start soon after midnight." The journey, too, was made at a season when the heat of summer had parched up the grazing and dried all but the principal water-holes. On leaving Gaza, the caravan marched to within sight of Beersheba but did not enter that town. Fabri writes:

Sept. 9. From Gaza. "We went towards the south and had the city of Beersheba not far on the *right*." [An obvious slip for *left*.] "We camped not far along the high road in a field called Gazmaha."

Sept. 10. Up at dawn. "By a flat land for the most part sandy and sterile." View on the right of the Mediterranean, "and we saw the city of Beersheba . . . that day." They pass a place with many terebinths and figs "like oak-trees." At evening to a small village called Lebhem. An old well here is called by the Saracens "the well of St. Mary."[4]

Beersheba is 28 miles from Gaza and, since they only went a short distance on September 9, a full day's march of 25 miles on the 10th would not have brought them very far beyond that city. The site of "Lebhem" cannot be very far to the south-west of Beersheba.

Sept. 11. Up before dawn. Over "sandy ground," uncultivated and bare. In the afternoon to hilly country, dry and bare. Camp at Chawatha (so called by Arabs),

[1] Published by Eyre and Spottiswoode, London, 1954.

[2] This journey is the subject of Miss Prescott's 'Once to Sinai,' to be published by Eyre and Spottiswoode in the autumn of 1957.

[3] In 1875, Lieutenant Conder's survey party was challenged near Gaza by twenty horsemen of the Tiyaha, "all well mounted and armed with swords, guns and pistols." But they left the surveyors alone when they found they were not Tarabin, with whom the Tiyaha were then at war. Conder, 'Tent Work in Palestine,' vol. 2, p. 171.

[4] Fabri's Latin diary has been considerably abridged. The translation is Miss Prescott's.

between two hills. Many traces of human habitation and "more than twelve great walled cisterns, round about which lay many broken bits of tile and earthen vessels and the dross left after smiths' work." "A heathen cemetery" and many traces of quarrying for "white marble." The ass drivers are sent to a distant well for water.

"Chawatha" is, doubtless, Khalasa. Their day's march must have been rather less than 21 miles—the distance from Beersheba to Khalasa.

Sept. 12. Start in the dark . . . Into yet more arid country. In one place "there seemed to have been a great confluence of waters, as if there had been a lake, and there were many great pits made by the flowing of the water and, though it was a flat country, the ground was misshapen and we had to climb up and go down all the time."

To a yet more desert country. "We went up from the plain . . . into a country

burnt up by the sun and completely sterile with rocky cliffs and sandy hills and wadis full of stones and very rough."

Into a plain "dry and wide." At evening into a country where the hills, plain etc. are white. Camp in a wadi called Gayan.

They seem to have followed a course parallel to, but well to the north of, the normal route from Beersheba to Egypt and, for some reason at which we can only guess, to have avoided the permanent wells at Hafir el-'Auja and Birein. This deviation was to involve them in the dune belt east of the Wadi el-'Arish; but they camped before reaching this, perhaps in the Wadi el-Khabari, north of the dunes called Makassar el-Fanagil. The day's march was about 16 miles.

Sept. 13. Start after midnight. Reach and ascend a sandy hill . . . Down into a valley through loose sand. A narrow valley between sandy hills. A long winding valley to "a wadi which the Arabs call Wadalar. This wadi, as is clear to see, is at times full of water which goes by its channel to the Mediterranean, for it leads straight to the sea coast." The sides of this wadi are of rock, not sand. After a long time, the rocks change to sand. They climb up sand at a point where the side of the valley is lower and enter another wadi "which bent from south towards east, by which, when water flows, it flows to the Dead Sea." The sides of this wadi are of stone "with rocks and cliffs quite white as if covered with snow." They go straight across this wadi and along the opposite ridge for a little to a place suitable for descent into "another wadi, deep, stony and altogether arid . . . which is called Magdabel." The ass drivers are sent for water to a marsh not far off, where Arabs generally encamp. This water is white and thick, "more like milk."

"Wadalar" is, without doubt, the great Wadi el-'Arish, the "river of Egypt," the only Sinai wadi to reach the Mediterranean, which the caravan must have reached at Maqdaba at the head of the long straight reach which leads to Bir Lahfan and the sea. Above Maqdaba the walls of the wadi are steep and change from loess to sandstone. The point where the bank is lower and they were able to climb up out of the wadi bed on sand would be at Awlad 'Ali, about three miles above Maqdaba. There, they cut off a bend and came back to the same Wadi el-'Arish at Abu 'Aweigila where they crossed to the west bank. Fabri's remark that the rocks were as white as snow makes this identification of the crossing certain since it is only at Abu 'Aweigila that the Wadi el-'Arish cuts through white limestone. The guide's story that they were now in a wadi that drained to the Dead Sea was perhaps due to Fabri's asking leading questions. The only Sinai wadi that does drain to the Dead Sea is the Wadi Girafi, 60 miles away to the south-east and far off their course. The caravan proceeded along the west bank for a short distance and then descended, not into another wadi, but once again into the Wadi El-'Arish or a tributary near Ruwaf'a, whence the ass drivers fetched water. Fabri's name "Magdabel" for the camp site must be a confusion with Maqdaba, the point where they struck the Wadi el-'Arish in the morning.[1] The day's march was about 22 miles.

Sept. 14. Up before daylight. Into a desert "without trace of man." Towards south. "We entered the region called by the Arabs Gebelhellel, in which desert the hills are compacted of very polished rocks." All day among hills. Towards evening, camp in a sandy place called Magareth, "under the hills." "Near us was . . . a solitary high round hill" with a cairn on the top. View from it of black and white heights.

[1] Fabri wrote up his diary of the journey from Gaza to "Hallicub" from rough notes at the latter place on the 17th.

The caravan threaded the gorge of El-Dha'iqa by which Wadi el-'Arish cuts the range of Gebel Hilal and then marched on the road to Hasana till they were somewhere near the south-western end of that range. "Magareth" does not seem to have survived as a place-name. Probably they marched about 22 miles.

Sept. 15. Start soon after midnight. March in a very cold wind. At sunrise into a sandy wadi in a sandstorm. About noon into another wadi, "great and wide." Here the dragoman offers them a choice. Either (1) "to shorten your journey and go quietly and without difficulty for three days" but no water on the way, or (2) "to cross this wadi and go down into another" in which there is a well where there may be water; but, if there is water, there are likely to be Arabs who may refuse to allow the pilgrims to draw water. If so, they will have "greatly lengthened out their journey for nothing." The pilgrims choose (2). They climb out of the wadi to a wide plain which the wind has blown clear of sand. At the end of this they look down upon "another wide sandy region" called Hachseve where there are Arabs encamped about a well. At sunset into a "terrible waste" called Minschene "where there was a great wadi girt with rocks and stony hills, all white and all the ground was like burnt lime."

The wadi where they were offered a choice must have been a tributary of their old friend, the Wadi el-'Arish. It is remarkable that there was no mention of the possibility of their watering at Nakhl, the principal source in central Sinai, only about 22 miles away in this very wadi. They took the course of going on to "Hachseve" which I take to be Hasana and of camping beyond it near Gebel el-Minsheta. Their day's march must have been 27 miles.

Sept. 16. Start directly after midnight. At sunrise "in a very rugged and sterile desert" called Larich, and "on the right hand very white mountains and likewise in the rear. But towards the east we had wide plains, of which the stones and sand were black and burnt as though fire had just burnt up everything combustible on those plains." No hills or mountains in sight. All day with white hills on right and black plains on left with no green thing growing. At evening they camp in a wadi where the ground was very rough and in which it is clear that at times water flows strongly. When Fabri asks the dragomen the name, they tease him by calling it "Albaroch."

"Larich" is, of course, the Wadi el-'Arish in whose flat and featureless basin they had been marching all day. They camped in a tributary of Wadi el-Bruk, itself a tributary of Wadi el-'Arish. Another march of 24 miles. Fabri's impression that he was being "teased" may, perhaps, have been due to the fact that the guides did not know the name of this tributary wadi; but kept repeating that it flowed *al Bruk*, *i.e.* "to (Wadi) el-Bruk." The tributary may have been the Wadi Abu Kanadu.

According to Fabri's diary, the pilgrims camped next day at "Meschmar" and on the following, the 18th, they met two caravans, one, presumably, on the Darb el-Hagg, the Mecca caravan route, and watered at "Alphogaya." But, the Darb el-Hagg and El Foqeiya are far to the north of Megmar. So it would seem that his entries for Sep. 17 and 18 have got transposed. Changing them back again, we may read:

Sept. 17. Start after midnight. They come to a place with white hills on the right and red "as if stained with blood" on the left. Needing water badly, they insist that the dragoman must take them to a well, even if off the track. He leads them far to the right into a wide and dry plain. Here they meet a caravan of Midianite merchants, bringing spices from the Red Sea. These beg water, having gone short for days. The pilgrims give what water they had left, because they will reach the water-holes before the time for evensong. An hour later they meet another caravan "from the furthest

parts of the east." This passes in silence, the men looking back at them with frowning faces. They find themselves on the verge of a "terrible and deep wadi which they call Hallicub." They go down and find water, bad but drinkable, in the holes and fissures of the rocks. They go up again to camp for the night. That desert, the plain and the valley are called Alphogaya in the Arab tongue.

Two main caravan tracks were crossed by the pilgrims that morning, the Darb el-Hagg running from Nakhl to Suez and an alternative road branching off from the first near Nakhl and reaching Suez by the Wadi Sudr. A roundabout route, much better provided with water than the other, which was used by Saladin on his invasion of Egypt. It is natural to suppose that the two caravans met with were on these, travelling from Arabia to Egypt. But, in that case, it is difficult to see why the first caravan should have been so thirsty—with Nakhl only a day's march away to the east. Miss Prescott has pointed out that the entry for October 1 in Fabri's diary shows clearly that Fabri considered that "Madian" was, or at least included, south Sinai and so the Midianite merchants bringing spice from the Red Sea may have been travelling from Tor to Palestine via Hasana. "Hallicub" may be the Wadi Khallal; "Alphogaya" still bears that name—"El Foqeiya." A march of 25 miles.

Sept. 18. Up while yet dark. They climb up out of the wadi on the right hand side. They march all day in the flood plain of a "great valley which was neither stony nor sandy but muddy and like potter's earth, of stiff white sand." . . . In front, a long way off "high but not wide and great hills." When they reach these they marvel "for they rose from the flat . . . and were white and as rounded as though they had been turned on a wheel." One of these the Arabs call Calpis. In the evening they come to a desert called Meschmar, where they camp. On the left a high white hill in which Fabri finds big caves. Outside are rubbish heaps, "not of dross or iron but of best Arabian gold."

Breydenbach, a fellow pilgrim, gives "Caleb" as the name of the hill that looked artificial. It must have been a Gebel Kalb, but the name does not appear on the Survey of Egypt maps. Gebel Megmar is of Eocene limestone; so the workings therein cannot have been for gold. Nitre for making gunpowder is the most likely mineral to have been sought by the Sinai Arabs. From El Foqeiya to Gebel Megmar is only about 18 miles.

Sept. 19. Start "in the middle of the night." Along a very narrow valley to a very long and sharp ascent which lasts till sunrise when they come to wide barren plains called Rackhaym where the stones and rocks were red and seemed as though on fire. After more than an hour they reach the end of the plain and come to a steep descent. View from the top of Mount Sinai and, on the right, of the Red Sea. Below is a wide plain and mountains rising always towards Mount Sinai. They descend with difficulty, especially for the camels. . . . The descent takes five hours. . . . At the foot they "seemed to be in another region for the desert began to be more humane and there were bushes and grass." They camp for the rest of the day at Ramathaym and spend the hot hours in caves.

They descended the escarpment of El Tih by the pass of Naqb el-Rakna and camped at its foot in the plain of Debbet el-Ramla. The "caves" were probably shelters beneath overhanging rocks. Their day's march from Megmar would have been about 20 miles.

Sept. 20. Start two hours before sunrise. At the end of the desert place they go "among very steep mountains by a wide and fair valley." Its name was Hinischena.

The steep and high sides of the valley were of red rock. They reach a desert called Schoyle and camp in a valley.

After crossing the plain of Debbet el-Ramla, they entered the hills by Wadi Khamila and followed a well-used track to the monastery by Wadi Barq and Wadi Labwa. They camped most probably in the latter near its confluence with Wadi Agir. If so, they marched 23 miles.

Sept. 21. Very early start. By "a quite beautiful valley" with high rocky sides "of a strange and wonderful shape." Trouble with some Arabs. After a long time they reach the end of the valley where there is a wide plain from which rise, opposite, mountains among which is Mount Sinai. "We went on therefore by the plain opposite the mountains and, going into a valley, made a wearisome circuit turning this way and that according as the valley curved." They have to turn east, north and south. About midday the valley turns south again and "we left the high mountains behind and saw the head of Mount Sinai stand clear above all the other crests." But they soon leave this valley for one going north and suspect they are being misled. They go thus a long way until "after a long descent the valley curved again towards the south." About sunset they reach a wide plain surrounded by mountains. In the centre "a group of many rocks striking out of the ground and making a little hill." The plain is called Macharea. They are surrounded by mountains through which they can see no way out. Here Moses fed Jethro's sheep.

They went on by Wadi Berra to its junction with Wadi el-Akhdar and, then, for some reason, doubtless the "trouble with the Arabs," [1] did not cross into Wadi el-Sheikh, the usual road to Mount Sinai, but ascended Wadi el-Akhdar. Then, following its tributary, Wadi Hargus, they issued on the plain of Elw el-'Agramiya and rejoined the usual route near El Watya. Just short of the pass, they camped. A circuitous march of about 27 miles.

Sept. 22. Very early start. When they reach the wall of rock they find a narrow fissure by which they enter; but "so narrow that a laden camel can hardly go through." Inside is another plain with grass, herbs and bushes. Very high mountains all round. For several hours they ascend towards the east, then turn into a valley going south and towards a great wall of rock in which they find a narrow passage. Rough going, especially for the beasts. The ravine widens, they see buildings and a long church. Sinai.

Fabri greatly exaggerates the narrowness of the Watya pass. They ascend Wadi el-Sheikh, going south not "east"; and then turn west till they come to the mouth of Wadi el-Deir, turn up it and come to the Monastery. A march of 11 miles.

Sept. 22–27. They stay at the Monastery of the Transfiguration on Mount Sinai.
Sept. 27. Start in the afternoon. Camp at Wachya.

They return to El Watya; but camp south of the pass, not north as they did on the night of the 21st. A march of 10 miles.

Sept. 28. They repass the narrow opening and come again into Macharea. "At this point we left the way by which we came . . . on the right and went down on the

[1] The pilgrims were now in the territory of the Towara or "Arabs of Tor" who claim the sole right to escort, against payment, any pilgrims to the monastery. No doubt their conductors from Gaza had some dispute with these local Arabs about the fee to be paid for passage; and to avoid actual fisticuffs, took the roundabout way by Wadi Akhdar. This dispute must have been adjusted while they were at the monastery for they took the usual route on their return journey.

left by a wadi opposite" very pleasant, full of bushes and tamarisks on which was dew sweet as honey from which manna is made. About noon we climbed into that wadi where we had a brush with the Arabs. Towards sunset they camp in a dry and desert wadi called Elphat.

They marched till noon down Wadi el-Sheikh, the usual route to and from the monastery. The grove of tamarisks from which "manna" is still obtained by the monks is the well-known grove of Tarfet el-Gidarein. About noon they crossed from Wadi el-Sheikh by Wadi Soleif to Wadi el-Akhdar and retrace their steps by Wadi Berra to Wadi Labwa where "Elphat" must have been. A march of 24 miles.

Sept. 29. A hard day's journey by the same route as the one by which they reached Sinai through wadis "not sandy, which we could have borne, but of dust or rather of ashes." They see in one valley an idol in the shape of an Ethiope boy in a cave. Camp in an awful place called by the Arabs Effkayl.

The idol must have been at Sarabit el-Khadim, whose name preserves the memory of a *khadim* or "negro servant." "Effkayl" cannot have been far beyond this, perhaps in Wadi Suwiq. Another day's march of 22 miles.

Sept. 30. Start directly after midnight, four hours before day. By daylight they are in "the desert of Ramathaim." Here they leave to the right the route by which they came to Sinai and "we went down towards the Red Sea." They leave the baggage camels to proceed along the direct way and follow an Arab who guides them to a place where there are footsteps of many Arabs and flocks. There are water-holes but the water is too salt to drink or only fit for beasts. The guide digs a shallow hole with his hands and the water which seeps into it is "thick but sweet." They overtake the camels and camp at Laccrara.

On reaching the Debbet el-Ramla, they allowed the baggage camels to cross it towards Wadi Homr. They themselves deviated to some water-holes which I cannot identify. Paul Walther says they turned to the right into a valley where there were several salt wells. This visit delayed them and they only made good about 15 miles from their starting point. "Laccrara" is the Wadi el-Qarura, a small tributary of Wadi Homr, which joins it from the south, just east of Gebel Sarbut el-Gamal.

Oct. 1. Start at dawn, [Ramadan has begun] by sandy plains. They leave the mountains and come into the country of Madian above the Red Sea. Here they rejoin the high road they had left at Gazara. It branched there—one fork by the Mediterranean to Egypt, the other from Egypt to Madian and Thor. At evening to the desert of Helim where Israel encamped at 12 wells and 70 palm trees. [There are not now exactly 12 wells nor 70 palm trees; but a great many.] The pilgrims go an Italian mile off the road and camp at Dorondon.

"Dorondon" is obviously Wadi Gharandel where there is water and palms. A march from Wadi el-Qarura of 25 miles.

Oct. 2. Start late after sunrise. Along the high road and camp at Wardachii early in the day. A party goes down to the sea to bathe, gets benighted and nearly lost.

"Wardachii" is Wadi Wardan, about 20 miles from Gharandel.

Oct. 3. Start before full daylight through wide sandy flats. After sunrise into the desert of Sur. Pilgrims ask to go down to the Red Sea and are given Arab guides to go to the shore while the camels follow the high road. They catch up the camels at some wells where the water is warm, salt and red in colour. The name of this plain is Marath. Pilgrims go on to camp at Hanada.

The warm wells referred to are "Moses' Wells" or 'Ayun Musa. They camp half a mile to the north at the foot of a low escarpment. March about 26 miles.

Oct. 4. Start before daylight, "Descending through wide and arid plains they come at last to a certain hill to the foot of which a tongue of the Red Sea stretches out and then comes to an end." A port here where ships touch. Among the mountains where the Red Sea ends they see the remains of an ancient canal. At noon they reach a great well, the well of the Soldan, where the water is warm and slightly salt. At sunset they camp at Choas.

The remains of an ancient canal are still to be seen well to the east of the present road from 'Ayun Musa to El Kubri. Arab tradition declares that there was once a great well here called El Ghardaqa which supplied Suez. Or it may be that the pilgrims in passing saw the remains of *Amnis Trajanis*, the forerunner of the present Sweetwater Canal, a little west of El Kubri. "The well of the Soldan" must be Bir 'Ajrud, some miles to the west of Suez; and "Choas" somewhere in the Wadi Yusara. They marched perhaps 25 miles.

Oct. 5. Up in the middle of the night. Through a wide and arid plain. Camp at Sunset at Maffrach.

"Maffrach" stands for the Arab Mafraq, meaning a road fork and may have been somewhere near the Hagg station of Dar el-Hamra (now Dar el-Beida), about halfway between Cairo and Suez.

Oct. 6. View of the Nile flood from a hillside. They pass Achacia, leaving it on the right and reach Matharea.

"Achacia" must be El Khanka and "Matharea" Matariya, now a suburb of Cairo which marks the end of what may be termed Fabri's homeward journey.

DETECTION OF MOVEMENT OF PEBBLES ON THE SEA FLOOR BY RADIOACTIVE METHODS

J. A. STEERS AND D. B. SMITH

ONE OF THE most difficult, yet very important, problems to solve in coastal physiography is the movement of material on the sea-bed. It is sometimes possible to argue strongly in favour of a direct onshore supply of material to a beach, but it is none the less extremely difficult to prove such a supply, apart from large stones partly buoyed up by seaweed growing on them. With this in view an experiment was carried out off the headland of Scolt Head Island in April and May of 1956. After preliminary discussions it was agreed that the experiment—to the best of our knowledge the first of its type, at any rate in this country—should be made with pebbles marked radioactively.

In each pebble used in the experiment, a hole half-an-inch deep and one-eighth inch in diameter had to be made. It was found that the flint pebbles on the beach of Scolt Head Island were too hard, and only a few were bored. A compromise was made and pebbles of Permian Sandstone, and a number artificially made with cement, were used instead. All the pebbles—there were about 1200 altogether in the experiment—averaged about 2 inches in major diameter. Their specific gravity was approximately 2·4, or about 0·2 less than that of flint.

After the pebbles had been prepared at the Department of Geography at Cambridge, they were sent for treatment at Harwell. The radioactive tracer used was barium-140, which is an isotope the half-life of which is twelve days. It decays by beta-emission and low energy gamma radiation and evolves into lanthanum-140, which has a short half-life of forty hours. Of the gamma rays emitted by the lanthanum, the energy of the principal one is 1·6 Mev. These gamma rays were used in detecting the pebbles on the sea-bed.

In order to avoid any hazard to health from the gamma rays, the pebbles were loaded with pure Ba^{140}. The La^{140}, negligible during the loading, increased to a maximum in about five days and, after that, was more or less in equilibrium with the Ba^{140}, and thereafter decayed with an effective half-life of twelve days. About 15 microcuries of Ba^{140} were absorbed to each of 1200 resin particles, one of which was placed in the hole in each pebble, and sealed in with a resin-based substance.

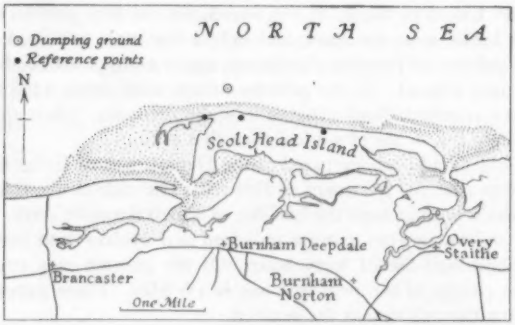
In order to find the pebbles on the sea-bed, three Geiger counter tubes were enclosed in a cylinder of brass, 1 metre long, and the tubes themselves had a sensitive length of 60 cms. The cylinder was fixed to a heavy metal sledge which was towed over the sea-bed. This operation had to be carried out each time a search was made, and since the detector had to be within 12 inches of a loaded pebble in order to "find" it, it will be realized that it was quite a task to explore the sea bed even within a radius of only 100 yards from the place where the pebbles were dumped.

The dumping took place on 5 April 1956, and all the pebbles were tipped over from the boat at the same time. Although the sea was somewhat choppy, it is more than probable that when they reached the bottom they were confined to an area of about 3 yards by 2. Previously a buoy had been placed (see map) at a point about 500 yards seaward of the normal high-water mark at the headland. The pebbles were put down 20 yards landwards of the buoy in order to eliminate any difficulties

between the buoy moorings and the towing of the sledge. The depth of water at this spot varied between approximately 25 and 12 feet at extreme high and low water of spring tides. For most of the time during which the experiment ran it may be reasonably assumed that the depth of water varied between 16 and 20 feet. There was a new moon on April 11, and thus, for the early part of the time, neap tides prevailed. The sea floor around the buoy was firm sand with some shingle.

The position of the buoy was fixed in relation to three points on the island from which theodolite and sextant readings were taken to the buoy. When readings on the detecting apparatus in the boat were made, observations by sextant on the land stations were taken, and estimates of the distance of the boat and sledge from the buoy were made at the same time. The position of the buoy itself was also checked by sextant readings taken from the boat when alongside it.

The weather at the time the pebbles were dumped was squally, and the night after, the wind force reached 5–6 on the Beaufort Scale. Directly the pebbles were put down on April 5, the detector was let down and clear records were obtained and showed that the apparatus was working correctly. No further observations were



possible, owing to poor weather, until April 8. Then unequivocal records by C. Kidson and J. R. Hardy indicated that some of the pebbles had moved southwards (*i.e.* shorewards) and a little to the west. The most distant "find" was about 200 feet from the original dump. Other careful searches were made by J. R. Hardy on April 9, 12, 21 and 23, and May 5 and 15. On all these occasions the records obtained were reasonably consistent, and proved that the southward and westward movement continued. The maximum movement in this direction was of the order of 260 feet. But on May 15 some clear records were found of some stones having moved north and west: one undoubted "find" was some 450 feet north-west of the original dump. This north-westerly movement may possibly have started much earlier, but this seems a little unlikely since this direction had been carefully swept in each search. Nevertheless, it is impossible to say that every yard of sea-floor was passed over by the sledge—and a good deal of time is taken in sweeping even so small an area as 100 × 100 yards, and there is no certainty, however carefully the sweep is made, that one or more strips have not been touched—and the uncertainty is greater in fairly rough water.

The experiment was certainly a success in its limited scope. It has shown clearly that stones are moved over the sea-floor in depths of 3 to 4 fathoms at times when waves of but moderate size are running. Estimates by all the members of the party

do not put the height of the biggest wave seen by them before breaking at more than 3 feet. On the night of April 8 there may have been some bigger, but it is unlikely. For the most part the waves, when there were fairly strong winds, were 2–3 feet high. The flood current off Scolt Head flows to the west at about $2^1/_2$ ft./sec. at springs—a figure obtained by direct measurement, in 1933, close inshore. It is extremely improbable that this or any other current which might occur on this part of the coast could, by itself, have shifted the stones, but it might have helped the waves to do so.

Enough has been achieved to suggest that the method has great possibilities. To obtain precise information on the movement of offshore material is of the utmost significance, not only in purely physiographical studies, but also in association with sea defence and harbour schemes. The experience we have gained of what not to do in this small experiment is in itself valuable. Unfortunately radioactive substances can be dangerous, and cannot be used to study movements of beach material by placing large concentrations on an open beach. Particularly in large scale experiments involving the use of long half-life isotopes, great care must be taken to ensure that safety regulations are followed. However, so sensitive is the method of tracing, that only small amounts of activity are required for each pebble, and in many studies elaborate precautions are not necessary, provided proper care is taken.

Throughout, the collaboration between Harwell, the Nature Conservancy and the Department of Geography was complete, and we are especially grateful to W. W. Williams who also was responsible for the necessary surveying. The cost of even a small-scale experiment of this kind is considerable, and we should like to acknowledge most gratefuly the financial help given by the University of Cambridge, and by the Nature Conservancy, whose physiographer, C. Kidson, joined fully in the carrying out of the experiment; and also the generous way in which the Atomic Energy Authority at Harwell helped to make the undertaking possible.

REGIONAL VARIATIONS IN THE TREND OF ANNUAL RAINFALL OVER THE BRITISH ISLES

S. GREGORY

DESPITE THE NUMEROUS studies which have been made of rainfall in Britain, there is one problem which so far has not received adequate attention. Although it is appreciated that annual rainfall values have fluctuated considerably over the years, and also that these fluctuations vary from one part of Britain to another, there has been no delimitation of those areas within which the trend of annual rainfall is virtually comparable for all localities. In other words, regional variations in the trend of annual rainfall have not been defined, and the spatial limits of different trends not delimited. This problem is one which is peculiarly geographical, both in its formulation and in many of its implications. The concept of regional definition is probably one which springs more readily to the mind of a geographer than to that of most other workers in the field of rainfall studies. Once defined, regional differences will also increase our knowledge and appreciation of such problems as those of urban water supply, of crop yields and of the expansion or contraction of agricultural activities, especially in marginal areas. Moreover, there is every likelihood that the basic geographical factors of positon and relief may prove to be the major causes of any regional differences which are found to exist.

Earlier studies

The only earlier attempt to consider the whole of the British Isles on the basis of annual rainfall changes was that by Glasspoole,[1] who used correlation coefficients for the period 1881–1915 for Glenquoich in the western Highlands and for Oxford. From the maps constructed on this basis, a broad distinction can be drawn between the western Highlands, south-western Scotland, the Lake District and north-eastern Ireland on the one hand, and the rest of the country on the other. Furthermore, a marked absence of correlation is indicated between annual rainfall conditions over the western and eastern coasts of Scotland, whilst a strong correlation is suggested between the conditions over the Grampians and those of the southern half of England and Wales. These distinctions and relationships can at best be only a general indication of the true position. Moreover, even this status is suspect for only two points of reference are used—Oxford and Glenquoich. Unless these two stations represent the only sets of conditions present in Britain, or at least the two main sets, then a large element of the true picture is omitted and the general impression conveyed is partially false.

Conditions within several areas of Britain have also been studied by comparing station graphs constructed from running or overlapping means. Thus Goldie and Carter [2] have indicated differences, especially of dates of maximum and minimum values, between the north-western, south-western, north-eastern and south-eastern areas in Scotland, using ten-year running means expressed as a percentage of the 1881–1915 average value. No attempt was made, however, to delimit the areas within which these varied conditions obtained.

The definition of areal differences in the trend of annual rainfall was attempted for

[1] Glasspoole, J., "A comparison of the fluctuations of annual rainfall over the British Isles." *Brit. Rainf.* (1922) 260.

[2] Goldie, A. H. R., and H. E. Carter, "The trend of annual rainfall in Scotland." *Trans. Instn. Wat. Engrs., Lond.* **44** (1939) 93.

south-western Lancashire and northern Cheshire by Boyd,[1] himself a geographer, using five-year running means for a large number of stations in a small area. Local

Figure 1. Annual rainfall regions of the British Isles

differences were discerned, mainly related to degreee of westerly exposure, but many of these were merely minor differences within a reasonably uniform trend.

More recently this problem has been studied for southern England,[2] using ten-year

[1] Boyd, D. A., "Annual rainfall fluctuations in south Lancashire and north Cheshire." *Quart. J. R. met. Soc.* **63** (1937) 503.

[2] Gregory, S., "Annual rainfall areas of southern England." *Quart. J. R. met. Soc.* **80** (1954) 610.

running means for the period 1900–39 for a large number of stations, and grouping together those stations with comparable trends of annual rainfall. Several areal differences in the trend became apparent, but especially the contrast between the Thames basin and East Anglia on the one hand, and the areas to the west and south on the other. These differences were then checked by a more detailed study, based on individual yearly values rather than on ten-year average conditions. Areas were defined on the basis of the years in which exceptionally high annual rainfall was experienced, as also were areas similarly based on exceptionally low, and on normal, annual rainfall conditions. This detailed study confirmed not only the essential validity of the areas defined on the basis of ten-year overlapping means, but also the value of this latter method for defining general regional variations in the trend of annual rainfall. It demonstrated that the pattern of decadal trends was not seriously affected by single abnormal years, but rather that it reflected the relative frequency of wet, dry and normal annual rainfall conditions within successive overlapping ten-year periods.

Methods and data

In this present paper, the use of graphs of ten-year running means of annual values has been expanded in time to cover the period 1881–1950 and in area to cover the whole of the British Isles. As in the study of southern England, the general nature of the trend has been considered of greater significance than the precise decade in which a maximum or minimum value was reached. Also, for the difference between any two decadal mean values on the graph to be considered as a valid criterion of change that difference needs to exceed a certain critical limit. A value greater than twice the standard deviation of the difference has been adopted as a sufficiently stringent statistical test. In practice this approximates in most cases to about 10 per cent. of the mean values being considered, although obviously this does not hold true in all cases. If two points on any graph differ by less than this amount, that difference in value is considered to be insignificant unless surrounding stations show a comparable change of a statistically significant magnitude for the same period. The use of this method has been criticized on the grounds that it obscures minor fluctuations and accentuates fluctuations with a periodicity of ten years. As a result Kraus,[1] in his papers on changes in tropical rainfall conditions, has used graphs of cumulative percentual deviations from the mean, or residual mass curves. He, however, is concerned with the specific dating of rainfall changes. The method provides no additional help in the present problem of the definition of homogeneous areas, despite the considerable extra labour of calculation which is involved. Moreover, in the graphs constructed for this paper there is no visible sign of any major distortion on a ten-yearly basis. The ideal data for the solution of this problem would be a large number of records, each homogeneous throughout, continuously returned for a long period. In practice, the longer the period used the fewer the records available, so that a compromise has to be adopted. This involves using a smallish number of records for a long period of years by which the overall trends may be defined, and a far larger number of stations for a shorter period to facilitate the more accurate definition of regional boundaries.

In a recent paper on rainfall variability,[2] the records of over two hundred stations were checked for their reliability for the period 1901–30. These records have formed the short-period data for the present work. Of these, about fifty were expanded to the seventy-year period 1881–1950, and the records again checked for homogeneity, these providing the long-period data required. In this way an adequate network was

[1] Kraus, E. B., "Secular changes of tropical rainfall regimes." *Quart. J. R. met. Soc.* **81** (1955) 198. "Secular variations of east-coast rainfall regimes." *Quart. J. R. met. Soc.* **81** (1955) 430.

[2] Gregory, S. "Some aspects of the variability of annual rainfall over the British Isles for the standard period 1901–30." *Quart. J. R. met. Soc.* **81** (1955) 257.

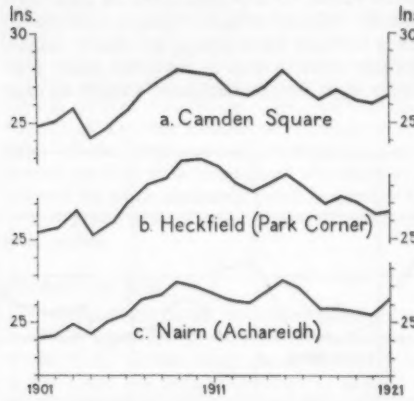
established over most of the British Isles, although a few areas—especially parts of highland Scotland—were rather scantily served. From these data graphs of ten-year running means were constructed. The trend characteristics, *i.e.* the periods of significant increase and decrease in decadal mean values, were defined from the 1881–1950 graphs, and on examination several markedly different groups of graphs were readily distinguished. Fortunately, the differences between these groups are clearly marked within the shorter 1901–30 period—probably more so than in any other thirty years between 1881–1950—so that the numerous short records facilitated a fairly accurate

Fig. 2. Characteristic trends of annual rainfall in the British Isles, 1881–1950

definition of boundary zones between areas with different trends. Four major regions, each with its own characteristic annual rainfall trend, have been defined and delimited. They are shown in Figure 1, along with the stations employed, whilst typical samples of the graphs constructed are shown in Figures 2 and 3. The source for all three figures is *British Rainfall* (1881–1950). In Figure 2 and the four parts of Figure 3 the curves consist of overlapping means; decades are indicated beneath the graph, the first year of the decade being given. Naturally, within any of these broad regional divisions variations of a minor nature occur between the trend of one station and that of another, these variations resulting from local shelter or exposure. They do not, however, significantly alter the basic overall trend of annual rainfall within the region concerned.

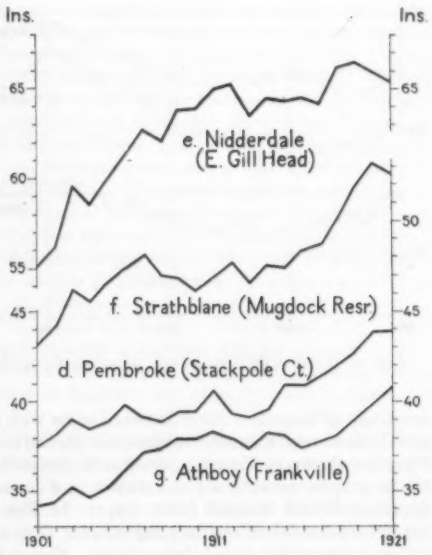
Annual rainfall regions

Region I.—The characteristic trend of annual rainfall in this region was an initial fall till *c.* 1892–1901 followed by a steady increase in decadal mean values till *c.* 1909–18. From then until *c.* 1922–31 these values varied little from this high level, but this was followed by a slow decline until the end of the period (see Oxford, Fig. 2). The date of commencement of the final decrease in decadal mean values varies to some extent, but the arrival at the maximum by the 1909–18 decade is constant, and forms the main distinguishing feature in the short-period graphs (Fig. 3). Throughout Region I all stations experienced these conditions, no matter what the local site factors of altitude and exposure may have been.



This region consists of two distinct areas, both on the eastern side of the country. In England the land boundary runs roughly westwards from the Medway estuary along the line of the North and Marlborough Downs, then crosses the western end of the Oxford vale, and swings north-eastwards and northwards along the Jurassic scarplands to the Humber estuary. It thus encloses the area draining to the Wash and all the Thames basin save for its Wealden tributaries. In Scotland comparable conditions occurred north-east of a line from the Beauly Firth to the coast between Montrose and Stonehaven, thus enclosing the arable lowlands of north-eastern Scotland. These conditions are not represented in Ireland or Wales, and they would seem to reflect maximum protection from, and minimum exposure to, westerly influences.

Fig. 3. Characteristic trends of annual rainfall in the British Isles, 1901–30. Region I (above). Region II (below)



Region II.—Throughout this region decadal mean values remained relatively steady from the beginning of the period until *c.* 1898–1907, following which they showed an almost uninterrupted increase until *c.* 1922–31. After this peak these values fell but later steadied or even rose slightly again before the end of the period (see Wigan Waterworks, Fig. 2). This region is thus distinguished

from Region I by the later beginning of the major rise in decadal mean values of annual rainfall (1898–1907 compared with 1892–1901), and by its continuation until 1922–31 instead of levelling out at a high level after 1909–18. Again this prime distinguishing feature of the continuous rise is clearly discernible in the short-period graphs (Fig. 3), and these characteristics are observable for all stations no matter what the local site factors may be.

This region is virtually "Highland Britain" apart from the northern and north-western areas which form Region IV. Within Region II lies most of Wales, the Isle of Man, lowland Lancashire, the Pennines, an extension to the east coast over the north York Moors and the hills of County Durham, the central sections of the Cheviots and the southern uplands, much of the central Lowlands of Scotland, the central and western areas of the Grampians, and the western and southern coastal areas of Ireland with an extension eastwards across the central plain. This distribution suggests a relationship with westerly exposure, save where Region IV introduces a new element in the north-west.

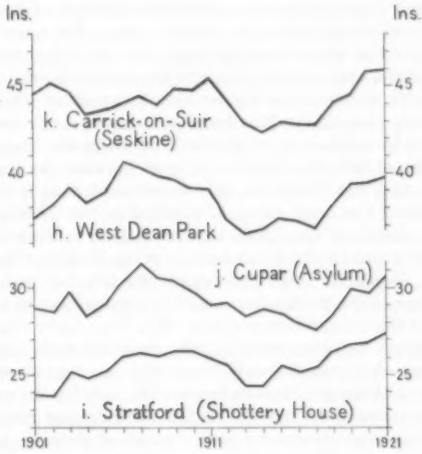
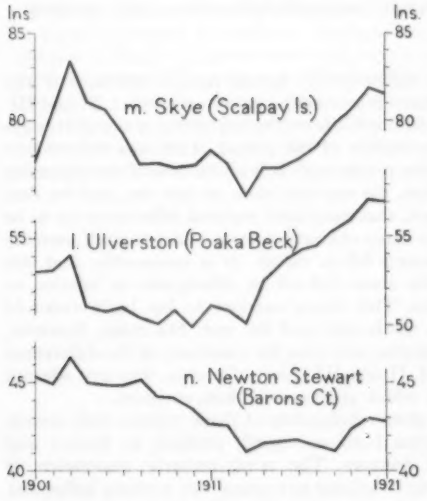


Fig. 3. Region III (above); Region IV (below)

Region III.—Here the trend characteristics are much less clearly defined than in any of the other three regions. This is essentially a belt of territory transitional in character between Regions I and II, and this fact is reflected in several ways. Firstly, the majority of graphs possess some characteristics typical of both neighbouring regions. The major rise in decadal mean values begins *c.* 1892–1901 and reaches a peak *c.* 1909–18, as in Region I. Values fall after this, however, only to rise to a second peak *c.* 1922–31. This is sometimes the maximum, as in Region II. It is difficult to present a really typical graph for this region because of its transitional nature, but conditions at Batheaston Reservoir (Fig. 2) are as representative as any. The feature of the double peak and intervening lower values *c.* 1913–22 is again clear in the short-period graphs (Fig. 3). A second reflection of this region's transitional



character is that it is not really homogeneous as regards trend characteristics for it includes some localized instances of trends more typical of the bordering regions. Thus several records for the rather more exposed Forest of Dean and the West Midlands Plateau are very like those of Region II, while some in the sheltered Severn and Avon valleys are comparable to those of Region I. It is here, in fact, that strictly local setting and site factors play a far more significant role in determining the trend of annual rainfall than they do in the other three regions. A third illustration of this transitional character is provided by the very shape of the region, which varies with the nature of the terrain. It is narrow where a high upland area lies close to the east coast, as in Northumberland and south-eastern Scotland, or close to Region I, as in north-eastern Scotland or along the Ouse–Trent valley. Conversely, where a broad belt of lowland intervenes between the western highlands and the east coast, as across the Midlands, this transitional zone is also broad. Again, the region extends along the south coast of England to the Thames estuary, this eastward extension of transitional conditions around Region I being facilitated both by the uplands of the area and by the water surface of the English Channel.

Region IV.—In this region the trend of annual rainfall differed from that of the rest of the British Isles, whilst yet retaining at least some similarities with conditions in the neighbouring region (II). The curve rises from an initially low value, at first slowly and then more rapidly, to a first peak variously between 1897–1906 and 1903–12. A decrease then set in until *c.* 1913–22 (a period of maximum values in Region I and of rising values in Region II), only for the curve to rise to a second peak between 1921–30 and 1924–33. At this time decadal mean values of annual rainfall were at or near their maximum in all regions of Britain. After this time values at first declined in Region IV, and then began to rise again to the end of the period (see Loch Finlas, Fig. 2). The short-period graphs also display these characteristics by what may loosely be termed a "central minimum" (Fig. 3). Region IV is in essence the north-western fringe of the British Isles, and its annual rainfall trend is clearly distinguished from that of the rest of "Highland Britain" especially before the *c.* 1921–30 peak.

Conclusions

Despite these clear and significant differences of annual rainfall trends, it is also true that there is some element of general relationship between Regions I, II and III. In all three can be seen a marked rise in rainfall from the beginning of the 1881–1950 period to a maximum at or after the middle of the period. This was followed by falling values, the fall starting in all cases *c.* 1923–32. It is in the date of the beginning of the major rise in decadal mean values, the rate and mode of that rise, and the date at which maximum values were reached, that significant regional differences are to be found. Region IV, however, possesses many characteristics peculiar to itself, notably the early maximum and the large central fall in values. It is noteworthy that this region coincides very closely with the areas defined by Glasspoole in relation to Glenquoich, using 1881–1915 figures. This lends support to his basic two-fold division of the British Isles into the north-west and the rest. His maps, however, suggested neither the nature nor the degree, nor even the existence, of the differences here demonstrated between Regions I, II and III. Nor, of course, was any attempt made at delimiting the bounds within which similar conditions occurred.

Another noteworthy feature is the close relationship of these regions with certain clearly defined locational characteristics both as regards position in Britain and position in relation to major relief features. The north-westerly association of Region IV is plain. Region II seems to be related to exposure to westerly influences and therefore occurs typically on western coasts yet extending eastwards over any exposed upland areas. Region I, on the other hand, is limited to east coast "lowland" areas, wherever shelter from the west and rain-shadow influences are at a maximum, whilst Region II, as mentioned earlier, varies in shape and size with the breadth of the lowland, or exposure of the upland, concerned. In other words, the regional

pattern here defined is the result of the action of the precipitation processes of the atmosphere upon a particular physical environment—the uplands and lowlands of the British Isles.

Finally, what are the major implications of these regional variations in annual rainfall trends? The most obvious is their influence upon urban water supplies. It is clearly dangerous to rely solely, or even mainly, upon supplies drawn from only one of these regions, for then a decline in rainfall will affect the whole source area at one and the same time. London, with its excessive reliance upon the Thames and the North Downs–Chilterns artesian area—all in Region I—is a case in point. Conversely, if supplies are obtained from two or more different regions—as with Manchester, drawing both from the Pennines (Region II) and the Lake District (Region IV)—there is a greater safeguard against declining reserves. A decrease in one region may well be offset by an increase in the other. Another aspect of water supply problems is that reservoirs constructed on the basis of rainfall received in the 1910's and 1920's—as many were—may prove inadequate in those periods of more frequent low annual rainfall which are almost certain to occur. It should be remembered that over most of the country the 1910's and 1920's returned the highest decadal mean values for at least the last seventy years, if not longer, being in many cases some 25–30 per cent. higher than in the 1880's.

Associated with these changes in rainfall there must also have been changes in the rate and volume of river flow and discharge, and changes in the rate and degree of erosion and deposition. Equally, these precipitation fluctuations must have influenced not merely crop yields, but, especially in marginal areas, the economic and ecological possibilities of agricultural expansion and development, the very continued existence of agriculture at times, and, of course, the nature and composition of the "natural" vegetation. This influence was not merely through an increase or decrease in available moisture but also by changes in temperature and sunshine induced by changes in cloudiness and storminess. Neither should it be forgotten that fluctuations in evaporation will at one time partially offset, at another time accentuate, these fluctuations in the incoming supply of moisture. Furthermore, as conditions were getting wetter, for example, in Region II in the 1900's and 1910's, so they were getting drier in Region IV at the same time. Thus no generalized scheme can be applied to the whole country. These and other various problems of "applied climatology" require detailed local studies for their satisfactory solution. The basic framework into which these studies may be fitted, however, is provided by the major regional units shown in Figure 1 and their characteristic annual rainfall trends for 1881–1950 illustrated in Figures 2 and 3.

A NEW INDUSTRIAL AREA IN ASIATIC U.S.S.R.

J. P. COLE

THE DEVELOPMENT of industry in Asiatic U.S.S.R. has frequently been mentioned both in Soviet and in non-Soviet publications. Owing partly, at least, to the intensity of Soviet propaganda on the subject, the relative importance of the eastward shift of industry into Asiatic U.S.S.R. has, perhaps, become exaggerated. Even the War, which accelerated the industrialization of certain regions east of the Volga, and necessitated the movement of equipment eastwards from the parts of European U.S.S.R. in greatest danger of invasion, could not have created the need for large

Fig. 1. Economic regions of the U.S.S.R.

industrial centres at very great distances from the areas of fighting. Nevertheless, a number of important projects are outlined for Asiatic U.S.S.R. in the Sixth Five Year Plan.[1] Among the reasons why certain areas to the east of the Urals should have been chosen for further industrial expansion are the need, arising from the evolution of new weapons, for centres of industry as far as possible from non-Communist countries, the establishment of a Communist government in China and the development for agriculture of new lands in Western Siberia and northern Kazakhstan.

Although for reasons of security certain mining and industrial centres of the U.S.S.R. may be omitted from economic maps in Soviet publications, thus giving a false picture of their distribution, there is no doubt that a considerable proportion of the total industrial capacity of the country is even now concentrated in the three

[1] *Pravda*, 15 January 1956. The Plan covers the period 1956–60.

regions which, in 1913, dominated all branches of processing and manufacturing industry except the food industry; namely the Moscow region, the Ural region [1] and the South.[2] Further, much of the remaining capacity appears to be concentrated in a few other large centres, including Leningrad and the Volga towns, and in some less extensive industrial zones, including the Kuzbas.

Although the chemical and textile industries and even most branches of the engineering industry are concentrated mainly in European U.S.S.R. it is the production of iron and steel which is most localized in the U.S.S.R. The following table shows broadly the regional distribution of centres of the iron and steel industry according to three postwar publications (for titles see notes to table). An approximate indication of the relative importance of the steel production in different parts of the U.S.S.R. is given in column IIIb, while column IV shows where new iron and steel centres not shown in a 1949 publication have appeared in a 1954 publication.

	I			II			III		IV
	a	b	c	a	b	c	a	b	
South*	11	3	14	20	4	24	113	35	3
Urals†	9	2	11	11	4	15	121	38	14
Kuzbas‡	1	1	2	1	2	3	14	4·5	1
Rest of European U.S.S.R.	3	7	10	4	13	17	58	18	5
Rest of Asiatic U.S.S.R. ..	1	4	5	—	4	4	14	4·5	—

* Including iron and steel works of the Donbas, lower Dnieper area, and coast of the Sea of Azov.

† Including Aktyubinsk.

‡ Including Novosibirsk.

I. Baransky, N. N., 'Ekonomicheskaya Geografiya S.S.S.R.' Moscow, 1949, p. 33.

a Iron and steel centres b Steel centres c Total

II. Lyalikov, N. I., and others, 'Geografiya S.S.S.R.' Moscow, 1955, p. 116. The map on this page has symbols of two sizes for iron and steel centres. In columns IIa, b and c two points have been given to the larger centres, one to the smaller ones.

a Iron and steel centres b Steel centres c Total.

III. 'Geograficheskiy Atlas dlya uchiteley sredney shkoly.' Moscow, 1954, p. 109. On this map no distinction is made between centres producing pig iron and those only producing steel. The figures in columns IIIa and IIIb therefore represent steel producing capacity, not pig iron. Symbols of three different sizes are used to represent iron and steel centres. In column IIIa 16 points are given to the largest symbol, 5 to the intermediate symbol and 3 to the smallest symbol, this being the approximate relationship the areas of the three symbols bear to each other. In column IIIb figures in column IIIa are expressed as percentages.

IV. In the 'Geograficheskiy Atlas' (1954) there are many new iron and steel centres not shown in Baransky (1949). Column IV shows the number of new iron and steel centres (without considering their size) in each region.

Note.—On economic maps in recent Soviet publications only a few different sizes of symbol are used to represent industrial centres or particular branches of industry. As they only give a general idea of the importance of each centre, the figures in the above table show only approximately the importance of the iron and steel industry in different parts of the U.S.S.R.

It appears that almost three-quarters of the steel producing capacity of the U.S.S.R. is still concentrated in the South [3] and the Ural region, while Asiatic U.S.S.R., including the Kuzbas, has less than 10 per cent. More striking, perhaps, is the fact

[1] The Ural region (Ural), with industrial centres on both flanks of the Ural Range, and therefore partly in European U.S.S.R. and partly in Asiatic U.S.S.R., forms one of the main economic regions of the U.S.S.R.

[2] The South (Yug) includes the Donbas, lower Dnieper and associated industrial centres.

[3] In 1950 the South accounted for half of the Soviet pig iron output and one-third of the steel output (Lyalikov, p. 118).

that almost all the new iron and steel works appearing for the first time in the Geograficheskiy Atlas (1954) are in European U.S.S.R., including the Ural region.

The most striking feature of the distribution of industrial centres in Asiatic U.S.S.R. itself is the limited industrial development in the regions of Eastern Siberia and the Far East.[1] These lie to the east of the Kuzbas and together include more than 40 per cent. of the territory of the U.S.S.R. They have only two steel-producing centres, 10 out of 111 thermal electric power stations in the U.S.S.R. shown in the Geograficheskiy Atlas,[2] but not one of the 38 hydro-electric stations shown, and 40 out of 332 towns which increased in population more than ten times, or which were created, during the Soviet period.[3] Ten of the eleven largest centres in these regions lie on or close to the Trans-Siberian Railway, away from which industrial development has been very limited.

The small extent to which Soviet industry has shifted eastwards of the Yenisey appears even more striking when it is remembered that Chelyabinsk (52° E.), in the Ural region, is only a little more than one-quarter of the distance along the parallel 55° N. from the Baltic (22° E.) to the Pacific coast of Kamchatka (153° E.) and even the Kuzbas (86° E.) is less than half-way along it. The remoteness of the Far East, and even more important now, perhaps, of China, from the main industrial regions in the U.S.S.R., can therefore be appreciated. Eastern Siberia and the Far East, although without extensive areas suitable for agriculture, have natural resources in the form of their forests, and their coal, oil and other mineral deposits, and the possibility of expanding industries in some area closer than the Kuzbas to China, to supply China and, if and when necessary, other countries of eastern Asia, must have received consideration in recent years. Two areas appear suitable, the Lake Baykal region and the lower Amur valley with the Maritime Kray.

The limits of the Russian State reached the Pacific in the seventeenth century, but even with the completion of the Trans-Siberian Railway before the Revolution, Russia encountered difficulties in defending her interests in the Far East against Japan. For a time, during the interwar period, the Soviet-held lower Amur valley and Maritime Kray were relatively insecure, placed as they were between Japanese-held Manchuria and South Sakhalin. Not surprisingly, therefore, industrial development in this region in the inter-war period does not appear to have been of more than local importance and local needs were not great, because conditions are not favourable for agriculture except in relatively small areas of the region.

Although the U.S.S.R. has now acquired South Sakhalin, and China has recovered Manchuria, Japan and South Korea still lie close to the southern part of the Soviet Far East, and consideration of its vulnerability, as well as of its remoteness, may still retard industrial development there to the extent that might otherwise be expected. China, however, has become a great importer of Soviet manufactures, principally, it is to be presumed, of capital goods, the production of which, according to the directives of the Sixth Soviet Five Year Plan, is to be increased greatly by 1960.[4] The U.S.S.R., therefore, requires an industrial base as close as possible to China and yet at as great a distance as possible from Japan and South Korea. The Soviet Far Eastern region is not suitable for this, while the Lake Baykal region is.

The most highly industrialized part of China lies to the north of Pekin, but the bulk of the population, and the areas in which new industries are being established, and which would therefore be in greatest need of Soviet capital goods, lie to the south of Pekin. This part of China lies closer to the Lake Baykal region than to the lower Amur region, and, in a direct line, Pekin is closer to Irkutsk than to Khabarovsk. Now that the railway from Ulan-Ude to Pekin, via Ulan-Bator (capital of the

[1] Eastern Siberia (Vostochnaya Sibir) and the Far East (Dalny Vostok) are two economic regions in Asiatic U.S.S.R.

[2] See map, p. 108.

[3] See Lyalikov, p. 81.

[4] *Pravda*, 15 January 1956.

45°N
PACIFIC OCEAN
30°N
Tokyo
JAPAN
150° E
SAKHALIN I.
Maritime Kray
EAST
SOVIET FAR
R. Amur
Khabarovsk
Vladivostok
Komsomolsk
MANCHURIA
KOREA
Seoul
120° E
Harbin
Mukden
CHINA
Blagoveshchensk
135°
Pekin
Trans-Siberian Railway
R. Amur
Tsining
INNER
Chita
EASTERN
MONGOLIAN
105°
Petrovo-Zabaykal
Ulan-Bator
Ulan-Ude
Korshunovo
R. Lena
SIBERIA
L. Baykal
PEOPLE'S
Ilimsk
Irkutsk
R. Angara
Cheremkhovo
Bratsk
105°
REPUBLIC
Krasnoyarsk
Achinsk
90° E
Stalinsk
R. Yenisey
Kuzbas
Novosibirsk
60°N
45°
Miles
100 0 100 200 300 400
Railways
Main Industrial Centres (U.S.S.R.)
Thermal Electric Stations (U.S.S.R.)
Main Industrial Centres (China)
Kuzbas & Cheremkhovo Coalfields
Head of Navigation on the Lena

Figure 2

Mongolian People's Republic, a convenient buffer State between the U.S.S.R. and China) and Tsining, has been completed (in 1955), the Lake Baykal region has become the obvious area for the development of heavy industry to supply China. The distance by rail from Ulan-Ude (where the new railway branches from the Trans-Siberian Railway) to Pekin, does not greatly exceed 1200 miles (the exact distance of the railway can not be measured on atlas maps), while Stalinsk, in the Kuzbas, which is at present the U.S.S.R.'s closest important region of heavy industry to China, is more than 2500 miles from Pekin by this railway. The rail distance from Khabarovsk to Pekin exceeds 1500 miles.

From a strategic point of view, the Kuzbas is the least vulnerable industrial region in the U.S.S.R., while its coal reserves are of good quality, extensive and easily worked. Nevertheless, although its development, beginning on a large scale only in the 1930s, was rapid, at least before the war, its industrial capacity does not rival that of the Ural region, which is more favourably placed to supply European U.S.S.R. Furthermore, the Karaganda coalfield is closer than the Kuzbas to the Soviet Central Asian Republics. Similarly, the Lake Baykal region is better placed than the Kuzbas to supply China. It seems, therefore, that as Soviet interest in China has greatly increased in the last few years, the Lake Baykal region has assumed greater significance than it had before.

Certain recent announcements suggest that within the next few years there is to be considerable industrial development in the region of Lake Baykal.[1] Forty-two per cent. of the Soviet hydro-electric potential is located in Eastern Siberia, a considerable part of it in the mountainous region of the upper Yenisey and its tributaries.[2] Towards the end of 1955 it was announced that work had started on a hydro-electric power station near Bratsk, on the Angara River, about 300 miles to the NNW. of Irkutsk. The capacity of this station will greatly exceed that of the Kuybyshev station (2,100,000 kWs), now nearing completion on the Volga, and will be about 3,200,000 kWs, while its output will be twice that of the Kuybyshev station, because it will be able to work at an even rate throughout the year.[3] The annual output will therefore be equivalent to that generated by approximately 10 million tons of coal in a thermal electric power station. A site has been chosen some 25 miles from Bratsk, at the Padunsk Rapids, where the river Angara is less than 1 kilometre wide, and flows between high banks. A reservoir exceeding 2000 square miles in area will be created.[4] A hydro-electric power station with a capacity of 660,000 kWs is also to be completed shortly at Irkutsk during the current Five Year Plan and one with a capacity of 3,200,000 kWs is to be started at Krasnoyarsk on the Yenisey. The transmission line now under construction between Bratsk and Irkutsk [5] will form the eastern part of a grid which is to extend between Novosibirsk and the Kuzbas in the west and Lake Baykal in the east.

While it is reasonable to assume that part of the power produced at these new hydro-electric stations is intended for use on the Trans-Siberian Railway, to be electrified between Krasnoyarsk and Irktutsk, not all will be needed for this purpose, and the new sources of power will greatly increase the possibilities of industrial development in the Baykal region. As well as the extensive coal deposits of the Cheremkhovo coalfield, the region has desposits of iron ore, tin and salt, while reserves of timber cover most of the area. The only centre in Eastern Siberia with an iron and steel industry at present is Petrovo-Zabaykal, with a small steelworks.

[1] In an article in *Izvestia*, 27 April 1956, it was announced that within the next 10–15 years large new iron and steel works would be established near the Kuzbas as well as near Bratsk, and elsewhere in the Lake Baykal region. See *Times Review of Industry*, July 1956, p. 82, for an account of the article and for a map.

[2] See Lyalikov, p. 111.

[3] This is because the Angara flows so fast that it does not freeze.

[4] Further details appear in articles in *Pravda*, 11 and 25 November 1955.

[5] *Pravda*, 6 November 1955.

The navigable section of the Lena extends to a point only about 140 miles from Irkutsk, offering possibilities for the movement of raw materials from the Lena basin to the Baykal region. Owing to the elevated and broken nature of much of the country and to unfavourable climatic conditions (the region lies to the north of 50° N., and includes considerable tracts of permafrost), areas suitable for agriculture are relatively limited. Should industries, and thus population, grow to any great extent in this region, it would doubtless come to depend on the supply of food from other regions.

The project to electrify the Trans-Siberian Railway as far east as Irkutsk suggests that the line is already heavily worked and is therefore not an adequate link between the more westerly industrial regions of the U.S.S.R., and China. Sea distances between ports in European U.S.S.R. and China are great, both via Suez and along the Northern Sea Route. It may reasonably be assumed, however, that China will need Soviet industrial products for many years to come. As the Baykal region appears to be most suitable for future industrial development to supply China, it is probable that during the next decades its industrial capacity will be greatly increased.

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RIAS *SENSU STRICTO* AND *SENSU LATO*

C. A. COTTON

SOME EUROPEAN GEOMORPHOLOGISTS now treat "ria" as merely a synonym of "drowned valley," without distinction as to kind or size, including some mere creeks in this category. Thus, in a recently published work on coastal geomorphology by Guilcher, "ria" is defined as any valley system partly invaded by the sea. "Most commonly the drowning is due to the Flandrian transgression; it can also be the result of a subsidence" (Guilcher, 1954, pp. 117, 119). This practice follows suggestions of Gulliver (1899, pp. 167, 220) and the usage of Johnson (1919, p. 173), who described all coasts of submergence with the exception of fiord coasts as "ria shorelines," and it may be defensible to some extent on the ground that if such a definition of "ria" is adopted the use of the word facilitates concise statement and euphonious expression. As de Martonne (1935, p. 1023) has pointed out, however, the usage cannot be regarded as correct. Nor does it seem desirable, apart from academic considerations of priority, to extend so far the meaning of a term already usefully employed more or less exactly in the sense in which it was understood and defined by Richthofen.

Freely translated, Richthofen's definition is as follows: "On coasts that are transverse [to the structural grain of the land] the ends of ridges commonly jut out boldly into the sea, while [in between the promontories so formed] the sea invades the lower reaches of the re-entrants and valleys that separate ridges. Highly irregular coastal outlines are the rule, generally fringed by outlying islands. Such rias coasts are produced by positive shift of the strandline. . . . Though these [structural] conditions are only imperfectly fulfilled on the Galician–Asturian coast, it is only there that arms of the sea characteristically associated with them have a specific name (*rias*); the same designation may be applied to the more perfectly developed forms of other regions." (Richthofen, 1886, pp. 308–9.) Thus, adopting *ria* from the names given to gulfs or wide-mouthed bays with considerable extension inland in north-west Spain, Richthofen established the geomorphic use of "ria" as descriptive of some bays and gulfs similar *in a general way* to these. He assumed that the word, used as an empirical geographic term, already had that meaning; but he defined it more strictly in relation to "rias coasts;" and this redefinition holds good in geomorphology notwithstanding the application of the same name in Spanish to any river mouth. (Compare the artificially restricted geomorphic significance of "cuesta," another Spanish word.)

Penck (1894, ii, p. 566) has supplied a generalized description of typical Galician gulfs mapped as rias (Ria de Vigo, etc.): they reach to a maximum distance of 30 miles inland; they are funnel-shaped, or widen seaward, *i.e.* few or no parts are landlocked; and they are without relation to structure in the terrain (which is granite). The last-mentioned characteristic, indifference to structure, was not included by Richthofen in the definition of "ria" as a geomorphic term applicable to some other regions. A coast characterized by rias, or "rias coast," is on the contrary, as defined strictly by Richthofen, the deeply drowned margin of a terrain (generally of folded stratified rocks dissected by subsequent valleys) with trend or strike transverse to the coast.

The definition has been criticized as obscure by de Martonne (1909; 1935), who would keep the category of "rias coasts" distinct from coasts of transverse structure, and who has proposed to rename the latter the "Finistère type" (1909), though more recently (1935) he referred to them simply as "coasts of transverse structure." It was the transverse coasts that Richthofen had in mind as "rias coasts," however, as his original definition makes quite clear. Under this head he proceeded to enumerate features attributable to the drowning of marginal terrains *with transverse folded*

structure, and this description he set out so as to contrast it with that of drowned valleys of longitudinal folded structure ("Dalmatian type"). He described the embayment by deep drowning of a system of major rectilinear subsequent valleys that reach the sea more or less at right angles to the trend of the coasts; and he cited, among others, the embayed coast of south-west Ireland (Bantry Bay, Dingle Bay, etc.) as conforming to this specification. It does not appear that better examples of rias as thus defined are known anywhere, and it seems appropriate that this should be the type region, as it is also the one in which subsequent valleys were first observed and explained. De Martonne (1935, pp. 1022–3), however, prefers as examples the embayed margin of Finistère (western Brittany) and the gulfs of the Smyrna coast of Asia Minor.

In the belief that the designation "ria" implied the funnel shape and the morphology generally of the Galician rias, Richthofen boldly transferred that term, with a significance no longer merely empirical but for the first time explanatory-descriptive, from its setting in Galicia, the bays of which might not themselves conform strictly to the type thus newly defined, to demonstrably transverse coasts. De Martonne (1909; 1935) has perhaps failed to realize, or else rejects because he disapproves of the deliberate transfer of the term "ria" from Galicia to other regions with the structure specified.

From this point of view a question at issue is whether the rias of Galicia are true rias in the light of Richthofen's definition; for the position taken up by de Martonne is equivalent to a ruling that they are not. Setting aside Richthofen's definition of "rias coasts," he could, however, re-establish the Galician rias as typical "rias," and he would therefore describe the coasts of Galicia, embayed by "rias" that are assumed to be without structural control, as the typical rias coasts. Richthofen himself did not allege close resemblance or even general similarity of the structure of the Galician terrain to that typical of coasts of transverse structure, noting only resemblance of coastal outline. This latter he saw also in the insequent (but thus more generally dendritic, and also in some cases more sporadically spaced) drowned major valleys of some regions of horizontal structure (Sydney Harbour, etc.), though the distinction of these from a rather shadowy "Liman type" (Richthofen, 1886, pp. 310–2) is not very clear, together with those of various regions of massive crystalline rocks where these are deeply embayed—*e.g.* in southern China and on the west coasts of Korea and Japan. Another notable example in granite is the west coast of Corsica. Similar to massive terrains of granites, gneisses, and schists in their reaction to dissection by erosion, developing insequent patterns without recognizable control by structure, are some closely folded welts of stratified rocks. Examples of such are the intricately embayed coast of the Marlborough Sounds, Cook Strait, New Zealand, and that of the Ruus al Jibal, a peninsula separating the Gulf of Oman from the Persian Gulf that is also maturely dissected and deeply drowned.

Richthofen appears to have been content to leave to his readers' discretion the question whether the major drowned valleys of virtually structureless regions should be called rias, like those definitely adjusted to transverse structure. There has been some tendency among other writers so to include them; this seems to be the intention of Suess (1906, p. 203) when he writes: "rias coasts which indicate the subsidence of mountain chains." Birot and Solé Sabarís (1954) continue also to refer to the characteristic gulfs of Galicia as "rias." Though it might make for convenience to include all such ria-like bays and gulfs in a broad category of rias, a more conservative and strictly defensible course would be to exclude them as not conforming to Richthofen's definition, and to refer to them instead as *ria-like*. Perhaps it would be in order to think of rias *sensu stricto* and *sensu lato*.

It may obviously be deduced that in most cases "true" rias (or rias *sensu stricto*, which are features of coasts of transverse structure) in addition to being characteristically less dendritic than some, perhaps most, others of the ria-like gulfs produced by deep submergence, will differ from most such in that they are generally closely

spaced, or arranged in fascicles, being then separated from one another only by subsequent, or strike, ridges, which taper to points seaward—but these may become bluntly truncated by marine erosion. In contrast with rias so grouped, the "rias" of Galicia are described by de Martonne (1935, p. 1023) as "branching" gulfs "*dans une côte abrupte*," and a similar description fits the sporadically distributed drowned-valley systems of New South Wales (Broken Bay, Sydney Harbour, Botany Bay), which are separated by long stretches of cliffed coast, and which, as already noted, intersect a terrain of horizontal structure (one which, however, is classed by some German authors as a coast of transverse structure, apparently in the belief that Richthofen's inclusion of Sydney Harbour in the rias category implied this).

James Geikie (1898; 1904, p. 250) recognized that rias are major features, i.e. "long inlets stretching far inland" on "highly indented coasts," and it has long been understood that this development of indentations on a large scale distinguishes rias coasts from coasts fringingly drowned by such comparatively small submergence as can be satisfactorily explained by alternate dissection of and transgression on to marginal lands during glacio-eustatic oscillation of ocean level.

A positive movement of greater amplitude has been necessary in most cases for the production of rias coasts (in the broad sense). According to Davis (1928, p. 230) the characteristic features of the vast stretch of embayed and island-fringed coasts of south-east Asia, including the South China rias coast cited by Richthofen as a notable example, were produced by "gradual submergence" following "a long time of greater emergence and deep erosion." He remarks: "The erosion of the now submerged valleys of the mainland and the islands, as well as of the much broader valley lowlands between the mainland and the islands, . . . surely demands a greater emergence and a vastly longer time than can be provided during the glacial epochs of lowered sea level."

The vast irregularly shaped and branching bays bordering north-western and northern Australia for 1000 miles and penetrating inland for distances up to 100 miles deserve recognition as rias *sensu lato* developed on a scale unknown elsewhere. It would be tempting to dismiss these as probably similar in origin to the great tectonic gulfs of South Australia but that Jutson (1934, pp. 40–1) has observed no evidence of fault-block relief in the western half at least of the region they border. "So far," he writes also, "no fault scarp has been recorded on or near the western or northern coast" of this (Kimberley) district. There is a suggestion of downwarping of the land surface towards the coast from a high interior (Jutson, p. 41), apparently as a broadly developed marginal continental flexure, which has stimulated erosion of valleys, and which, as it continued more recently, has been responsible for extensive drowning. The outlines of the bays and the slopes of their inner coasts, which are in part precipitous erosional escarpments, are those characteristic of deeply drowned landscapes (see Jutson, 1934, Figs. 15–7). Like the rias *sensu lato* of New South Wales, these features intersect horizontally bedded formations, but, whereas in New South Wales the border of the Australian continent is a peneplain only youthfully dissected by widely spaced valleys, on the north-west coast this is dissected to maturity by similarly spaced valleys deeply incised. The shallow Sahul shelf, 100–300 miles wide, which borders the north-west Australian coast is apparently the result of very long continued accumulation of sediment that is deep enough to bury and hide the uneven surface of "a downwarped marginal belt of the formerly more extensive mainland" (Davis, 1928, p. 232).

Though confirmatory data may be scanty, generally owing to obscuration of the initial depth by abundant sedimentation, as in the case of the example last cited, the depth of water in rias and ria-like gulfs at or near their mouths, or the depth of fill in them, will usually be greater than can be accounted for except by regional sinking or the downwarping of coastal segments. It might be fair, therefore, to rule that rias *sensu lato* are evidence of tectonic submergence, or, conversely, to postulate in a definition of all rias that there shall have been submergence of this kind to initiate

them. An example of a coast indented by such drowned valleys is the embayed, or "rias," coast of the state of Maine; and a typical area of this coast has recently been investigated with the result that depths are now known to the base of recently deposited marine sediments, largely still submerged, which mantle a maturely dissected surface of considerable relief. Upson (1954, p. 295) points out that the base level to which the land was dissected in pre-Wisconsin times is now 400 feet below sea level. Allowance being made for the effects of isostatic downwarping under the Wisconsin ice and for subsequent recovery, though this is very probably incomplete, Upson finds that the drowning of the coast is due to "crustal deformation from causes other than ice loading." Being ice-covered, the land was not subject to subaerial dissection during the Wisconsin glacio-eustatic lowering of the ocean level; thus the drowned (and fossil) relief is entirely of pre-Wisconsin development, except for minor glacial modification.

Contrast between a coast drowned by eustatic shift of ocean level alone and one affected by tectonic submergence as well is seen on the north coast of Spain. Downwarping of many hundreds of feet from Asturias towards Galicia is proved by westward inclination of the main *rasa*, or coastal bench, of Asturias (Birot and Solé Sabarís, 1954, p. 54), and near Foz there is a transition from the small so-called rias of Asturias to Galician rias *sensu lato*. The former are drowned mouths of river valleys many of which are gorges at the seaward end (forming mere creeks). Where these are broader inland (being there subsequent valley floors submerged) they are infilled, but the maximum axial depth of fill, 160 feet (E. Hernández-Pacheco, 1930, p. 50), indicates submergence not greater than can be accounted for on the hypothesis of development during Pleistocene oscillation of ocean level.

Most bays of ria form and dimensions are due to considerable coastal subsidence despite the fact that quite moderate submergence would be sufficient, if it took place rapidly enough, to allow the sea to penetrate far inland along many valleys that have been excavated by large mature rivers of gentle gradient. Such penetration, however, if it takes place at all will generally be but temporary, even ephemeral. The loads of sediment brought down by such rivers are commonly so great that estuaries formed thus, initially or potentially, by transgression are filled in with alluvium perhaps during the transgression and in any case in a time so short as to be geologically negligible. Rias are not generally situated at the mouths of very large rivers.

The differential movements that have made rias and rias coasts, though generally more ancient than at least some phases of glacio-eustatic oscillation, must have been recent enough to post-date dissection of coastal lands in a major cycle not otherwise interrupted. In some cases the movement may be due to the Bourcart marginal flexure, or it may be a recurrence of foundering that has earlier been responsible for determining continental outlines of the "Atlantic" type. It is interesting to note that some of the inland, as well as coastal, features of Galicia can best be explained (according to Birot and Solé Sabarís, 1954, p. 31) by assuming rather recent (though not precisely dated) foundering of continental strips along the north and west coasts.

The events are obviously relatively modern that have established boundaries between land and sea that are very close to those of the present day. Notwithstanding this comparative youth, however, it is only rarely—e.g. in the case of the deeply drowned valleys of the west coast of Corsica, which are prolonged seaward as submarine canyons (Kuenen, 1952)—that the submerged seaward parts of the valleys remain unfilled. The Irish rias and many other rias and ria-like gulfs debouch on broad continental shelves; and the continuity of the shelf around the coast of Galicia is remarked on by Birot and Solé Sabarís (1954, p. 52).

Granting that the true rias of south-west Ireland and the prototype rias of Galicia have something in common, though it is perhaps little more than that they are large valleys or valley lowlands deeply drowned, it is of interest to inquire into the origin of the valleys that have become "rias" in the latter region. There has been little suggestion hitherto that they have anything in common with subsequent valleys

adjusted to structure. Such suggestion is now made, however, in the recent report by Birot and Solé Sabarís (1954) on the geomorphology of north-west Spain. Galicia, though drowned at its margins by comparatively recent downwarping on a large scale was somewhat earlier upheaved, and its upheaval was differential, being accompanied by fault-dislocation. That this took place in the Pliocene period is shown by attitudes and altitudes of different parts of very extensive Miocene-Pliocene surfaces of planation, since deformed.

The question arises whether the valleys with generally south-westerly orientation that have been converted into deep bays by the downwarping of Galicia as a whole are tectonic or are of erosional and possibly subsequent origin. In general they are found to be situated in fault angles between the fault scarps and back slopes of elongated tilted blocks with for the most part south-east-facing scarps. The degraded condition of the scarps and the advanced stage of dissection of the back slopes of the blocks are such, however, as to discredit a hypothesis that activity of the faults has been recent enough to have directly produced the embayment of the coasts—in other words, the irregularities of the coastal outline do not appear to be attributable to "transverse deformation." Yet the influence of tectonic form is seen in a somewhat misfit relation (pointed out by these authors) between embayed valleys and the rivers entering the sea at the bay heads, which would not be expected if these rivers had been entirely responsible for shaping their valleys. There is, however, evidence of some fault-line erosion also, to which valleys with this general trend owe their extension and deepening, at least in part; and there is thus a definite suggestion of a subsequent ridge-and-valley pattern. This is not adjusted to the outcrops of belts of crystalline rocks of different kinds in the granite terrain, but is related rather to the elongation of broad shatter belts (crush zones) produced by the faulting (p. 53). Discovery of this pre-drowning ridge-and-valley pattern of subsequent origin suggests that it may be justifiable to retain the coasts of Galicia in the category of drowned coasts *of transverse structure* (*rias coasts* as strictly defined) and to claim that the rias of this coast are true *rias*.

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FROM THE *JOURNAL* A HUNDRED YEARS AGO

THE FOLLOWING ABSTRACT is taken from "Notes on the Bonin Islands", by Captain Michael Quin, R.N., read to the Society on 28 April 1856, from "Letters relative to Port Lloyd, Peel Island; one of the Bonin Group, in lat. 27° 6′ N. long. 142° 16′ E." Printed in the *Journal of the Royal Geographical Society*, Vol. 26, pp. 232–234.

. . . . The first settlers were Richard Millichamp, a native of Devonshire, and his partner Mateo Mozaro, of Ragusa, who had been many years in the employment of Mr. Bennett of Rotherhithe, near London, an owner of whale-ships in the South-Sea fishery, and had also served on board an English sloop of war, named 'La Morne Fortunée,' in the West Indies. They sailed from "Oahu," the 21st May, 1830, with two Americans, one Dane, and a party of Sandwich Islanders, viz. five men, ten women, in all twenty persons, with the countenance and support of Mr. Richard Charlton, his Majesty's consul for the Sandwich Islands, who supplied Messrs. Millichamp and Mozaro with a "union-jack," and a paper describing them as deserving persons, who had, at their sole expense and risk, fitted out an expedition to settle on one of the "Bonin Islands," as per accompanying documents. From the schooner that brought them from "Oahu" two Sandwich Islanders and one American deserted, increasing their numbers to twenty-three. In all of original settlers there were twenty-five, who arrived at Port Lloyd 24th June, 1830. Of after-settlers there were seventeen, including six children, giving thus a total population of forty-two in all on the island.

The numbers on the island when the 'Raleigh' left Port Lloyd, 10th August, 1837, were as under:—

Names	*Born at*
Richd. Millichamp ..	Devonshire, Great Britain.
Mateo Mozaro	Ragusa.
Alden B. Chapin	Boston, United States.
Nathl. Savory	,, ,,
Carl Johnsen	Copenhagen, Denmark.
Seven men from the ..	Sandwich Islands.
Thirteen women from the	,, ,,

The Sandwich Islanders had bound themselves to labour for Messrs. Millichamp and Mozaro for a certain period. Messrs. Millichamp and Mozaro were of opinion that thirty more families—say three persons in each—could be comfortably and substantially located and fed, having besides a reasonable stock to dispose of to ships arriving, to supply themselves with clothing, tools, and a few dollars per annum.

The want of a fixed head, authorized by Government, was severely felt.

The "union-jack" given to Messrs Millichamp and Mozaro by his Majesty's consul at the Sandwich Islands being quite worn out, and their flag-staff blown down, I considered it my duty to supply these deficiencies.

Peel Island has already in good cultivation, sweet potatoes, Indian corn, onions, yams, pumpkins, water melons, and sugar-cane. Tobacco has been planted with such success that it is likely to give them a great deal of trouble from its spreading so fast, and the want of hands to gather it in and prepare it. It is said to be of excellent quality. A few good lemon-trees, planted from seed, bear well, but are neglected. Pigs are in great abundance. Wild hogs are numerous; also a breed of dogs from the

Sandwich Islands are so well taught that they will at any time, under the direction of their masters, find, attack, and bring down the largest hog.

The island has also many jungle fowl. Goats in a wild state are numerous on the Southern Head, which at high water is an island; no tame ones, save a pair left by the 'Raleigh'.

There are no noxious animals or snakes on the island; nor rats, but many mice. Sharks are numerous, but small: these the dogs frequently chase in shoal water, capture and drag high and dry on the sandy beach.

Although the timber is in great plenty, there is none fit for masts: one sort called '*tomana*' is used for floors and planking and ornamental furniture. The mulberry-tree is very hard, and is used for posts and stanchions. There is also a small quantity of sandal-wood.

Not the least vestige of previous occupancy has been discovered by the present settlers, who have now been resident since July 24, 1830, and have examined every part of the island. I am of opinion that Peel Island is one of the numerous islands in the North Pacific that has never been previously occupied.

THE FUTURE OF EAST AFRICA

EAST AFRICA ROYAL COMMISSION 1953–1955 REPORT. *London:* H.M.S.O., 1955 (Cmd. 9475). $9\frac{1}{2} \times 6$ *inches;* 482 *pages; maps.* 17*s* 6*d*

THE EAST AFRICA Royal Commission was established as a result of the well-argued case for the investigation of some of East Africa's problems by Sir Philip Mitchell, then Governor of Kenya, in his despatch, 'Land and population in East Africa' (Col. No. 290, 1952). This despatch was reviewed in the *Journal* (**119** (1953) 224–7) by Miss Jean Fortt who noted its special geographical significance and stressed the need for basic research. The report has been keenly awaited by all students of East African affairs and particularly by those who have been concerned lest the bestialities of Mau Mau should obscure the realities of the legitimate grievances and difficulties of the Kikuyu and other tribes and cause a delay in the tackling of East Africa's many pressing problems.

Sir Hugh Dow, the Chairman, brought to the Commission a wide experience of Indian conditions, several members had an expert knowledge of agricultural, economic and financial matters, and there was one African member, Chief Kidaha Makwaia. The report is the result of very extensive travels, deliberations and investigations and it provides a remarkably comprehensive and well-balanced survey of the Kenya, Uganda and Tanganyika of today, together with a host of recommendations of what the East Africa of tomorrow might be like, politically, socially and economically.

I was in East Africa for some time not long after the report was issued and discussed its contents, in general and in detail, with many officials and others, African and Asian as well as European. I was most impressed by the virtual unanimity of the view of people on the spot about the report's breadth of vision and the deep insight that it showed into the complexities of a very wide range of subjects. Criticisms there were indeed, especially from those who felt that their own particular contributions to the progress of East Africa had been wrongly or inadequately assessed by the Commissioners; and there was considerable scepticism about the feasibility, and even the wisdom, of some of the recommendations, particularly those relating to land policy. All in all, however, the report has been welcomed everywhere as an outstanding, sound and balanced contribution to the serious literature relating to East Africa, and it seems certain to have a very marked effect upon the development not only of these territories but of other British African areas in years to come.

Geographers will find the report of tremendous value: indeed for them this document will carry a special significance because of the emphasis repeatedly laid on the influence that the physical environment must have upon economic progress in East Africa, whatever the skin colour or the cultural or technological status of the people concerned. Some of these environmental facts are summarized in the four maps accompanying the report, which have been beautifully produced by the Directorate of Colonial Surveys. They show, *inter alia*, communications, distribution of population (though unfortunately the smallest dot used has to represent as many as 5000 people), the extent and location of alienated land, and the incidence of tsetse fly; but their main purpose is to indicate the reliability or otherwise of the annual rainfall over East Africa. It is this reliability from year to year that largely determines whether or not an area is suitable for farming, and if so, for what type. Work done by the East African Agricultural and Forestry Research Organisation in recent years, notably by Mr. J. Glover, suggests that agriculture is hazardous or uneconomic in those areas where there is a danger of the failure of the rains approximately once in every three years.

Thus data are shown in relation to various degrees of probability of obtaining a stated amount of rainfall—in one map, 30 inches, and in the other, 20 inches, the latter figure being regarded as the critical figure for the division of land into that which is suitable only for pastoralism and that where cultivation is possible. Colours are used to indicate the prospects of obtaining these amounts in so many years in a century, and these are described as "good," "fair," "poor" and "bad." The report admits that these are generalizations and that the distinctions made are selective and arbitrary, but it claims—and with very reasonable justification—that the broad impression conveyed is a true reflection of conditions. The maps show very clearly how enormous is the area which is unlikely to obtain 30 inches of rainfall in from thirty to a hundred years in each century: about a half of the whole of East Africa, including two-thirds of Tanganyika and one-third of Kenya. Uganda, by contrast, is much better and more regularly watered, as is suggested by its relatively high density of population.

To geographers there may not be anything startlingly new in the recording of these findings or in their correlation with certain social or economic distributions, but for the data to be mapped and published in this form in an official report is progress indeed: progress because cartographic technique has been very effectively used to emphasize the stark significance of the facts, and progress because it represents a much greater appreciation of the meaning of environmental factors than has usually been the case in reports of this nature.

This study of rainfall reliability represents but one, albeit the outstanding, part of the long section of the report concerned with "conditions for development of the land." Attention is also directed to other physical factors limiting land use, such as tsetse fly infestation, the shortage of water supplies, soil deficiencies and the incidence of human and animal diseases, as well as to the problems arising from inadequacies of communications and man-power and the lack of capital. Present land use by both pastoral and cultivating communities is discussed and is followed by a broad survey of the alternatives to this land use, with numerous suggestions regarding development priorities. So we are led to the most controversial and thought-provoking of all the twenty-six chapters, that dealing with the policy concerning the tenure and disposition of land which should aim, in the view of the Commissioners, at the individualization of land ownership. Only thus, they believe, can the conditions that at present prevent the available land from being effectively used be removed. While fully recognizing the problems raised by such a policy, they are convinced that unless individual land holding is established, the overall prosperity of the territories will be retarded.

The chapters on the development of the land form one section of the report, to which there are two complementary sections, each containing a wealth of geo-

graphical and economic matter. "Conditions for economic and social development" includes chapters on the marketing and distributive system; capital, investment and financial policy; manufacturing industries, the expansion of which seems likely to depend mainly upon the extension of the internal market; mining, which has so far made only a small contribution to economic progress; and the development of roads and railways, which now falls much short of the requirements of the territories. Other topics discussed are immigration policies, African labour, and education. Many urgent problems of public health should, the Commission feels, be investigated as soon as possible by a high-level expert body.

The third of these sections, "Conditions for urban development," calls for special mention if only because its very existence in a report on tropical Africa will surprise many. Here, often for the first time, are recorded in a convenient and succinct form some of the facts concerning the origin, growth and problems of East African towns. The Commission was impressed by their rapid growth, and by the fact that the non-African population was "not only highly urbanized but mainly concentrated in a few large towns." The growing number of Africans in towns live under most unsatisfactory conditions, and the administration of urban areas calls for careful attention. The report puts forward "the basis of a new urban policy" in which Africans would be allowed to play a full part in the life of the towns which are already "the centres of social and intellectual life, of economic enterprise and of political activity."

These three sections constitute three-quarters of the whole report. They are preceded by a series of introductory chapters grouped under the title of "basic problems." "The background picture" gives in twenty-five pages an excellent, concise account of the physical geography, population, history and economic development of the whole area. Six of these pages deal with the vital question of "the changing African" who has been so much affected by the coming of the European, the introduction of a cash economy, the establishment of new land policies, the influence of Christian missions and of western education, and the effect of two world wars.

Population worried the Commissioners less than it has some other authorities. Such statistics as are available, they suggest, do not support apprehensions concerning an unduly rapid rate of population growth: in any case, such growth "should present no serious overall problems provided that obstacles to the development of the modern exchange economy can be overcome." What did impress the Commission was "the stark fact" of the fundamental poverty of East Africa, both absolute and relative. This they traced to "the absence of sufficient commercialized and wage-earning activities for the indigenous population": but if the range of these activities is to be extended so that living standards can be raised, new ideas about land are essential. "The test of land *needs* must be replaced by a test of land *use*." The relevance of all this to geography does not need any emphasis or even comment.

In a penultimate chapter the report deals with the tremendously important problem of race relations in the attempt to link together under-developed poverty-stricken countries, like East Africa, and countries with technical knowledge and capital, like Britain and the United States. What is needed, the Commissioners say, is a policy "which can replace mutual fear by mutual hope."

The final section tries (not very successfully perhaps) to present some general conclusions for the whole report of 482 pages, and then proceeds to give a "guide to the main conclusions and recommendations." No review can adequately establish its importance or hope to summarize more than a few of its especially significant chapters. Any geographer interested in East Africa must read this report and possess his own copy, for he will need it for constant reference. For those with less direct geographical interest in the area, but with the rightful concern of the citizen for the problems of these British territories, two summaries may be mentioned: one by Mr. Philip Mason, 'A new deal in East Africa,' published by the Royal Institute of International Affairs (1955, 2*s*, 37 pages), and the other, 'The future of East Africa,' prepared by

Miss Ethel Wix for the Africa Bureau (30, Old Queen Street, S.W.1., 1956, 3s, 48 pages). Both are excellent and very readable: and if they make their readers turn to the full report, then they will have done exactly what their compilers and this reviewer would wish. It is too early to know whether the editorial published last year suggesting that this report would be placed in the Durham Report class was correct: but the Commissioners themselves may well be justified in stating that decisions to give effect to some of their proposals, notably those concerned with the ownership and use of land, may be "as important for East Africa as was the compilation of the Domesday Book for England in the eleventh century."

R. W. STEEL

A PILGRIM'S PROGRESS

THE WAY TO ILALA. By FRANK DEBENHAM. *London: Longmans, Green*, 1955. $8\frac{1}{2} \times 5\frac{1}{4}$ *inches;* 336 *pages; maps and illustrations.* 25*s*

A TURBULENT half-century has done much to obliterate the Victorian legend of David Livingstone as the starry-eyed prophet of Christianity among the tribes of the Dark Continent. Now Africa is dark no longer, or in nothing like the same sense, and the study of the explorer's copious records has been gradually revealing him for what he was, very human and deeply impressive. In 'The way to Ilala' we have the fullest and best informed and discriminating interpretation of the man, his aims and his achievements, by one singularly well qualified by experience and training. As a young geologist in Scott's last expedition Professor Debenham came to know the rigours of exploration, albeit in the Antarctic and not in the Tropics, and he has been over much of the country where Livingstone blazed the trails, while his book shows a scientifically trained mind, a poised judgment and a humane understanding, with a style both easy and natural. There is added grace too in the delightfully apt passages from Bunyan which, after an attractive old fashion, form chapter headings. Moreover for the first time authoritative comment has dealt with Livingstone's copious notes upon the geological conformation of the Zambezi basin and found them surprisingly far-sighted and intelligent, and it is the same with his alert and accurate observations upon flora and fauna and most other things pertaining to the Central African scene. The wonder at his effectiveness is increased when the unremitting pressure of responsibilities and difficulties is borne in mind. His many-sidedness and self-reliance stand out in higher relief than ever.

Indeed it is in this central topic, the singular character of Livingstone, that this work is most fascinating and enlightening. From boyhood his resolution was to get out into the world and justify himself, and he suffered no obstacle or opposition to halt or deflect him until he had proved its utter insuperability. The Transvaal Boers tried to bar his path into the interior and burned his homestead, but he passed them by and went on. Africa took hold of him, her riddles a challenge and her service a devotion. He flung himself into her cause without reserve or hesitation, and desperately gambled with the life and health of the wife he loved and with the life and health of his children. Africa became all in all and, more than ever after his harrowing wandering, back and forth, across the continent, it became in his imagination his kingdom. Professor Debenham's survey of his great triumph rightly throws into relief his selflessness, his resourcefulness in improvization against difficulties, his complete fearlessness, his industry and tirelessness. Very properly, too, he notes the importance of the Kebrabasa rapids in the last lap of his eastward march to the Indian Ocean.

Possibilities opened gradually to him. During his grand enterprise he meditated chiefly on Africa's geography and geology; the social and economic reflections came later, on his way home to the nation-wide welcome awaiting him. He took it calmly, as if he was but the instrument of a great purpose, but it warmed him within and made him eloquent on the causes unfolding within his mind.

It is at this point that his story glides into what was, in the deepest sense, tragedy. The completeness of his success was his undoing, beguiling or constraining him to leave his former single-handedness for cooperative efforts, for which neither temperament nor experience qualified him. Natural optimism, too, deluded him and, above all, his illusions about the Kebrabasa stretch of the Zambezi, a passage upon which Professor Debenham discourses most admirably, as he does also upon the progressive disruption within the Zambezi party that pulled down disaster upon it. But at the same time he does fine justice to the epic character of the story. Livingstone's wife had died, the Universities Mission, which his call had brought into being, had collapsed under fatal mischances, and most of his party had left for home. The last blow was his recall. Yet, unbroken and unbowed, his indomitable courage strove to turn the period of waiting, until he could obey the Government's orders, to further exploratory endeavours, as grimly harassing as any in the past. He made excursions into the farther coasts of Nyasa, undaunted by frustrations and still planning for the future, first a settlement where perhaps his daughters might join him, and then, more congenially, a fresh start into exploration of the reputed lakes and rivers to the north, including, maybe, the headwaters of the Nile. Then he handed over his Government property and, in order that his private launch, the *Lady Nyassa*, might not fall into the hands of slave-traders, he exposed himself, and his companions to hair-raising risks in navigating the slight craft, through the hazards of the monsoons, to Bombay. There he left her to be sold and made his way home.

In England, for all his failure, he found his popularity still deep and strong, but he was not one to let himself sink back into an idle twilight of reputation. Having suffered himself to be patched up medically as well as might be, he took the old trail again, back to the kingdom that he felt must presently be his grave, the "way to Ilala," as Professor Debenham finely calls it. He was Livingstone still, and the epilogue to his history matches the best of his other moments, in the steadfast devotion of his followers Susi and Chuma, who bore his poor eviscerated remains overland, through hazards and perils, to the coast to its lying-in-state at the Society's House in Savile Row, and to its resting place in Westminster Abbey.

Few stories can match David Livingstone's in fearlessness and self-sacrifice, and "The way to Ilala' rounds off its masterly recital with the last of those apposite passages from Bunyan that have already been mentioned: "his faith, his courage, his enduring and sincerity under all, have made his name famous."

J. P. R. WALLIS

FACT—OR FANTASY?

THE LONG WALK. By SLAVOMIR RAWICZ. *London: Constable*, 1956. 9×5½ *inches; 240 pages; 2 maps.* 15*s*

THIS IS THE story of an escape from a Soviet forced labour camp in north-east Siberia and of a journey thence on foot for 4000 miles to India. At the outbreak of war the author is a young cavalry officer in the Polish Army. After the fall of Warsaw he returns to his home in Eastern Poland where he is almost immediately seized by the Russians on a charge of espionage. After many months of solitary confinement and torture designed to extort a confession, he is sentenced to twenty-five years hard

labour. In November 1940, together with thousands of fellow prisoners, packed in cattle trucks, he is taken to Irkutsk, at the southern end of Lake Baykal, a rail journey of about a month. The journey (in December and January) from Irkutsk to "Camp 303," 1000 miles to the north-east across the Lena River, is made on foot with 5000 other prisoners (500 die on the way) all chained together behind lorries. In April 1941, the author and six others escape with the connivance and help of the wife of the commandant of the camp. A month later, on the shores of Lake Baykal, they are joined by a young Polish girl, herself a fugitive, the first human being they meet. From there they make their way across Outer Mongolia, the Gobi Desert and Tibet. Four of the party, including the girl, perish on the way and the survivors reach India in April 1942. The whole of the escape journey is made on foot, with practically no material resources and with only the slightest knowledge of the geography of the regions traversed.

Such a story should need no embellishment. A simple account of the facts could hardly fail to absorb the interest of the most hardened armchair adventurer, to chill the heart of the least imaginative reader. The narrative is indeed presented with apparent restraint; its attractive modesty claims our sympathy and our tolerance. We are willing to make every allowance for memory clouded by time and suffering. Yet, throughout the book, there are so many improbable circumstances, so many geographical details which fail to match our knowledge of the areas travelled, that it is impossible to trace the boundary between fact and fantasy.

Consider, for example, the section of the journey between the Tsangpo and India. The author believes that his route here lay a little to the west of Lhasa; but there is no need to be too particular regarding its exact whereabouts. Throughout its course, the Tsangpo is never more than 100 miles from the main axis of the Himalaya. The intervening country is very easy and can be crossed almost anywhere and at any time of year in six easy marches. We are constantly told that while on the march the party averaged at least 20 miles a day; and yet it took them two months (end of January until end of March) of continuous travel to reach the main range from the Tsangpo. Moreover, the statement, "In February we encountered our last village," is followed by a graphic description of many weeks of hazardous travel before the main range was reached. Where, along the northern side of the entire range east of Kailas, is there such a wide uninhabited belt?

The pass by which the range was crossed cannot possibly be identified from the description in the book. It is certain, however, that it did not lie on any regular route. Crossing the eastern Himalaya from north to south anywhere, one descends almost immediately, often in a matter of a few hours, into deep, heavily forested gorges. Here, the contrast from the stark, gently contoured Tibetan landscape is so dramatic that it cannot escape notice; upon men who have been struggling for twelve months, in abject destitution, across the deserts of Central Asia, it would certainly make the most profound impression. Had the party descended from the watershed into an uninhabited, pathless valley, they would certainly have been faced with difficulties of progress utterly unlike and far more formidable than anything they had encountered hitherto. In such valleys, dense vegetation, precipitous slopes and ravines cut by side streams usually limit progress to about one mile a day; surely a matter of concern to men without any food whatever. If, on the other hand, they had descended into an inhabited valley and had found a path, they would soon have encountered villages, which would have become increasingly frequent during the long march to the nearest motor road. Yet the narrative of this, the climax of the whole story, makes no mention of any striking change of scene, of any unusual difficulty or of any village where starving men might beg for food. Between the crossing of the pass and the encounter with a party of Indian troops near a motor road, the only sign of human habitation recorded is the sight of a flock of sheep on a distant hillside.

It is well known that thirst is more lethal than either hunger or fatigue. Individuals vary less in their capacity to withstand it, and it is thus comparatively easy to predict

how long a man can survive without water in any given circumstances. The chief factors, of course, are temperature, humidity and physical activity. Marching 20 miles a day across the Gobi Desert in summer may reasonably be considered very bad conditions. In these circumstances a man with absolutely no water is unlikely to be capable of further effort after two or three days, and would probably die in four. In this book we are told that the eight fugitives, on entering the Gobi, marched 20 miles a day for eight days under a scorching sun (they did not march at night for fear of going in a circle) without so much as a sip of water and with nothing but a few scraps of dried fish to eat. They all survived to reach an oasis. This ordeal was followed by another of twelve days' duration in circumstances exactly similar, except that this time they had practically no food whatever. Two of the party died, but the other six survived to reach a patch of mud. This astonishing feat of endurance was followed by a third waterless march of ten days' duration. During this, however, their sufferings were greatly alleviated by the consumption of grilled snakes.

With only the haziest knowledge of the lie of even the major geographical features of Central Asia, denied access to local knowledge by language difficulties and the need for secrecy, with no map, watch or compass, unable to identify even the Pole Star, route finding was a major problem for the fugitives. They assumed that India lay due south of the Lake Baykal, and, with the sun to guide them, they were careful to pursue a southerly course. Any deviation forced upon them by local obstacles called for special mention in the narrative. In fact, had they succeeded in maintaining a southerly course, it would have led them, through densely populated areas, to the South China coast opposite Hainan.

Here are a few of the minor points which call for clarification. On arrival at Irkutsk in mid-December, the prisoners were kept in the open for three days and nights in a "shrieking, whipping wind and a sub-zero temperature," half starved and "clad only in a pair of trousers, canvas shoes and a thin cotton blouse." How was it that any of them escaped the most severe frost-bite? It is remarkable that no mention was made of the important highway between Urumchi and Lanchow which the fugitives must have crossed before entering the highlands of Tibet, and which in 1941 was carrying heavy motor traffic. The alternative plans it would have suggested, the fear of capture which would have been the only argument against adopting them, the very sight of something so civilized as a telegraph wire, all these would surely have left an indelible impression upon their memories. Stranger still was their behaviour when, in the middle of Tibet, they met an elderly European missionary who had lived in those parts for most of his life, and with whom they conversed in German and French. It is amazing that men in their appalling plight, desperately in need of information, about to embark on what they believed to be the most hazardous and exacting part of their journey, did not seize this Heaven-sent opportunity of soliciting his help and advice.

Mountaineers will be interested to read of the novel methods employed to negotiate overhanging crags during their journey across the Tibetan plateau. They will also be surprised to find the party ruthlessly hurling boulders down the abyss into which one of their number has just fallen, to test its depth. Devotees of books about Tibet will be disappointed (or relieved) to find no mention of *tsampa*, a commodity in which the author and his companions must have been specially interested. But the reader must not complain. He is treated to a rare feast of adventure. As a final *bonne bouche* he is served with an encounter with an abominable snowman and his wife, who, with suspicious nonchalance, blocked the progress of the party for two hours, and eventually forced them to make a disastrous detour. One feared they might turn out to be Soviet agents in disguise. Perhaps they were.

ERIC SHIPTON

REVIEWS

EUROPE

GEOGRAFÍA DE ESPAÑA Y PORTUGAL. Edited by Manuel de Terán. Vol. 5. PORTUGAL. By ORLANDO RIBEIRO. *Barcelona: Montaner y Simon*, S.A., 1955. 11 × 6 *inches*

An important series of five volumes dealing with the physical and regional geography of the Iberian Peninsula has been started under the general editorship of Professor Terán of Madrid University. The first two volumes on the land forms, climate and vegetation have appeared since 1952, written by L. Solé Sabarís, P. Font Quer, N. Llopis Lladó and Valentín Masachs. Now the first of the regional volumes has been published. Those who benefited from the excellent excursion handbooks prepared by Professor Orlando Ribeiro and his colleagues for the International Geographical Congress at Lisbon in 1949 will now welcome this able summary of the regional geography of Portugal. It takes its place worthily alongside the regional studies by Lautensach, Girão and Birot as one of the authorative works on Portuguese geography.

The merits of this book are its balanced outlook and its unity of purpose, so often lost sight of in regional text-books, together with its close attention to the historical context. It is written in an attractive style, and well illustrated with new maps and photographs. The presentation reveals the discipline of the French school of Demangeon. The first nine chapters deal in turn with the position and character of Portugal, its land forms, climate and vegetation, the development of the nation, the population, rural life, settlements, the coastal environment, and the Portuguese economy. The concluding chapter outlines the distinctive features of the geographical regions. Despite this wide outlook, the author does not treat every topic for the sake of its inclusion in a general omnibus. The analysis of land forms, for example, is restrained, although much more could have been added in view of the author's intimate understanding of these problems. Nor are the regions described in pedantic detail.

Probably the essential value of this work lies in its underlying motif, the recognition of Portugal's personality. Despite its boast that the Portuguese frontiers are among the oldest in Europe, the nation has not been born merely of history. The position and character of the country have given it an individuality distinct from the rest of the Iberian Peninsula. First, the author reconsiders the duality of its environment, its Atlantic and Mediterranean characteristics, a theme which he has previously analysed in his book, 'Portugal, o Mediterrâneo e o Atlântico', 1945. Next, there is the recognition that apart from the physical transitions between these two contrasted environments, man has also helped to efface some of the differences. The human migration from south to north in Roman times blurred some of these differences. Since then the demographic currents from north to south, especially during the Reconquest and recently, since the end of the nineteenth century, in the revolutionary changes in the south, have further subdued the environmental contrasts. The integration of these contrasts, argues Professor Ribeiro, has thus produced the birth of the Portuguese nation. While the north has always been the seat of the nation, it is the south whose Mediterranean elements constitute the basis of its economy. Such is the theme maintained throughout this first-class analysis of landscape and nation.

J. M. H.

AGRICULTURE IN MALTA. A survey of land use, 1955. *Department of Geography, Durham Colleges in the University of Durham.* 13 × 8 *inches;* 12 *sections; maps*

At a time when Malta is pressing her economic problems upon the attention of Britain, and when geographers are pressing their claims for recognition as advisers in the field of economic development, the 1955 'Survey of land use' by the Department

of Geography, Durham Colleges in the University of Durham, has an importance beyond that of the actual data it contains. This is the first publication of a project in which the Durham Department of Geography is collaborating with the Royal University, Valetta. The project is under the general direction of Dr. W. B. Fisher and the 1955 field party was led by H. Bowen-Jones who is the author of the present report. To date, the team have crop-surveyed about 75 per cent. of the cultivated area of Malta on a 6 inches to the mile scale and more detailed surveys have been made in selected areas. The rest of Malta and the small island of Gozo are to be completed soon. The ultimate intention is to extend the study to cover demographic and social aspects and the need for biological, soil and geological studies is also suggested in the report. The material at present brought together comprises fieldwork details of crops and their distributions together with notes covering the available climatic, geological and similar data. This is essentially raw material from which the Durham team and possibly others will be able to proceed to more completely rounded studies. Probably of the greatest value to other workers are comments such as those on the availability and limitations of statistics, details often dearly bought in terms of wasted effort. The maps and sketches give valuable amplification to the written study and of particular interest is the extensive use of perspective sketches, a technique very well suited to the terraced cultivation so common in Mediterranean lands. In a set of "impressions and notes," published as an appendix to the main report, Bowen-Jones makes a personal first appraisal of the data and assesses some of the implications. Pending the completion of a considerable programme of basic research he suggests that current activity can best be directed towards "inducing mental effort rather than introducing real innovations."

Projects of this type, although not uncommon, are less usual in the field of socio-economic geography than might be desired. A great deal of fieldwork can be accomplished by undergraduates, to the advantage of their training, but there is the need for long-term direction of policy and assurance of facilities for working up results which they are unable to command. When such a scheme also embraces close collaboration with an overseas university and a stated intention to pursue the Maltese study in particular and studies of the Mediterranean region in general, it is greatly encouraging. If the geographer is to take his full place in planning and advising on economic development it is important that comprehensive schemes of this kind should be attempted. It is equally important that some reconciliation should be achieved between the academic principle of not coming to a conclusion if the evidence is inadequate and the practical requirement of giving the best judgement possible when it is clear that the necessary data are not available and are unlikely to become available in the near future. R. D. H.

ASIA

LA MÉDITERRANÉE ET LE MOYEN ORIENT. By Pierre Birot and Jean Dresch. Vol. 2: La Méditerranée Orientale et le Moyen Orient. *Paris: Presses Universitaires de France*, 1955. 9×7½ *inches;* vii+515 *pages; maps and plates*

Volume 1 of this excellent book was reviewed in the June 1954 number of the *Journal* and a great deal of what was said then is applicable to Volume 2. It is true of the second volume, as of the first, that "abundance of information, clarity and soundness of overall view" make it an outstanding volume, and this book, like its predecessor, "combines a measure of general treatment with considerable detailed exposition of topics for the specialist, and presents the results of extensive first-hand research." Once again, the discussions of structure "make little concession to the non-specialist," climate is not very extensively treated, and it is "in the domain of rural economy and settlement that MM. Birot and Dresch make their most important contribution." The material on these topics is indeed wonderfully rich, and a great deal of information is included which must be new to almost all students in this country.

Volume 2 deals with the Balkans, Asia Minor, and the Arab Middle East. The

accuracy and assuredness with which very diverse topics are treated is impressive, and there can surely be no other single book which deals with these three large regions so thoroughly and satisfactorily. The methods of treatment and the principles of selection are interesting. Political geography receives a minimum of attention, and the treatment is rather of geographical regions, large and small, and of the facts of physical or human geography, than of political entities. The Arab states, for example, are not dealt with singly and in relative isolation; the section headings of the chapter entitled "The countries of the Arab Middle East" are (1) Unity and diversity, (2) The desert countries, (3) The Asiatic margins, and (4) Africa. Historical geography as generally conceived in this country as a series of snapshots of the geography of an area at various periods, is not employed (probably in part because of lack of space as well as lack of material). Rather are the characteristics of the human geography of an area analysed and then related to the facts of history, or these facts are set out with the geographical consequences to which they gave rise, as for example in the chapter "Les conséquences de la domination turque et des impérialismes."

The thoroughness and accuracy which is characteristic of the book in general is unfortunately not quite so evident in the treatment of one subject which should, in view of its great importance, receive particular attention—that of Middle East petroleum. The oil map dates from 1950 and has been badly edited (no company is shown as operating in Kuwait!) Some small errors are noticeable elsewhere, for example in the section dealing with the Persian Gulf. It is not true, for instance, that the majority of the population of Bahrain is Shi'ite and speaks Persian, nor that Iran lays claim to any oases in the interior of Arabia (pages 433–4). The bibliography and index are excellent. N. N. L.

KUWAIT AND HER NEIGHBOURS. By H. R. P. Dickson. *London: Allen and Unwin*, 1956. $9\frac{1}{2} \times 6$ *inches; 627 pages; plates, line drawings and maps.* 75*s*

This large and rather expensive book covers a lot of ground, both within and without the limits of Kuwait, and of time, too. Indeed, to provide a background, Colonel Dickson has included enough of the history and customs of the Arabs to do more than satisfy most readers. There is an adequate epitome of the rise of the Wahhabi power and a thrilling first-hand account of the great rebellion against Ibn Sa'ud in 1929–30. The author's adventures as a young political officer under Sir Percy Cox in 'Iraq are very exciting and his later life in Kuwait after retirement from Government service makes good reading. Here his wife has helped him out with accounts of visits to the *harim* of Ibn Sa'ud and to other Arab ladies.

Geographers will be interested to hear that the small lakes in the oasis of Jabrin south-east of Riyadh are artificial; that is, they are the result of ancient bore-holes, "150 feet deep or more," which have tapped a prolific water-table. This is stated on the authority of Aramco geologists, who have pumped one of the lakes dry and excavated the shaft which supplies its water.

On top of this exciting stuff we come to the modern miracle, the discovery of oil in Kuwait and its frightening consequences for immediate good and ultimate evil in Arabia. The author dismisses this subject rather briefly: perhaps because his daughter, Mrs. Freeth, has dealt with it at more length in her recent book, reviewed below, 'Kuwait was my home.' Towards the end, the book drags. There are too many Arab legends about their ancestors and Colonel Dickson is too polite in hesitating to express doubt of some of their modern fairy tales. That of the American doctor's successful angling inside a patient for camel-ticks (pp. 531–2) is absurd. Nor is there any real need to ascribe the recovery of a sufferer from viper-bite to a (live) Muslim saint eight hours' camel journey away. Both the Egyptologists Dr. A. E. Sayce and Rex Engelbach survived bites from horned vipers without spiritual help. The author is charitable even to Palgrave whose account of a visit to Nejd a century ago is termed "vivid and truthful." Palgrave's account is certainly vivid but some have been found to doubt whether he ever visited Riyadh at all. G. W. M.

KUWAIT WAS MY HOME. By ZAHRA FREETH. *London: Allen and Unwin*, 1956. 9×6 *inches;* 164 *pages; illustrations.* 16*s*

Kuwait was Mrs. Freeth's home and so she is well qualified to describe the chameleon changes that are passing over this little state, now the third oil-producing country in the free world. From zero in 1946 its production has jumped to 54 million metric tons a year and its population has soared to 300,000; its ruler's annual income has risen to £60 million. This he spends wisely and £100 million is earmarked for rebuilding and development during the next ten years. Prosperity has come to the poorest and even the outcast Solubba have new clean huts and wireless aerials, and come home in large red trucks. The author gives a lively description of the primitive Arabs of the hinterland and the fishers and boatbuilders of the Gulf. Kuwait has no water supply on the spot and, till lately, water was brought in by sailing boats from the mouth of the Euphrates 80 miles away. Now a distilling plant provides a million gallons a day and will soon supply ten times that amount. But distribution to the poorer quarters is still by donkey and waterskin. Of necessity the original population is being shouldered out by newcomers, often Palestinian refugees with a grudge against the British. Mrs. Freeth gives us a vivid and accurate account of Kuwait. G. W. M.

INTO CHINA. By CLAUDE ROY. Translated from the French by Mervyn Savill. *London: Sidgwick and Jackson with Macgibbon and Kee*, 1955. $8\frac{1}{2}\times5\frac{3}{4}$ *inches;* xii+420 *pages; sketch-map and illustrations.* 25*s*

The author of this beautifully illustrated travel book is described by the publishers as "a prominent figure in the post-war French literary world, a poet and critic well on the left, who was accepted without reserve by the Chinese authorities and given every facility for travel and research" during the course of a visit to China some three years ago. Of his literary abilities there can be no doubt and the present book abounds in such telling descriptions as, for example, his portrayal of the Great Wall as "the ramparts of Carcassonne on the planet Mars."

Nevertheless the book as a whole is unsatisfying. As an account of the author's own travels it is irritatingly vague and disjointed while in its attempts at political analysis it is superficial and credulous to a degree which not even a poet's licence should be allowed to excuse. The author is at pains to correct what he assumes to be the popular western belief that "the Chinese is a pot-bellied, fatalistic chimpanzee, indifferent to torture and death, a prolific breeder, who lives on rice, tea and opium, hating foreigners, selling his children for a song, etc." But whether the new-style Peking man whom he describes, with his addiction to Buchmanesque confession and self-reformation and his complete absence of any observable human frailties, apart from a regrettable tendency to spit on the ground (" 'one day we shall teach them not to' . . . my guide whispered in my ear") is any more true to life the reader may well be inclined to doubt. This is unfortunate. For if the author had not set out to prove that everything in the Chinese garden is lovely, or at least well on the way to becoming so, he could have written a very good book. C. A. F.

WHERE THE TURK TROD. By ANTHONY RHODES. *London: Weidenfeld and Nicolson*, 1956. 8×5 *inches;* 188 *pages; sketch-maps and illustrations.* 18*s*

NEW BABYLON. By DESMOND STEWARD and JOHN HAYLOCK. *London: Collins*, 1956. $8\frac{1}{2}\times5\frac{1}{2}$ *inches;* 256 *pages; illustrations.* 16*s*

Of these books, the second claims, in its sub-title, to be "a portrait of 'Iraq," but, in spite of an almost excessive variety of themes, we never quite see the true subject. The first, making no claim to be more than a travel book, sets itself a more limited purpose but succeeds in being a far more readable book. Many of the devoted visitors to the Dalmatian coast would confess to little knowledge of Bosnia and Herzegovina, other than that gained from a stamp album in childhood; but Mr. Rhodes will escort them to many fascinating places and to meet many interesting people—the Reis Ul Ulema, leader of the Moslem community, a group of bear hunters and a cousin of Archduke Franz Ferdinand's assassin who has much to show in Sarajevo. For one

is taken on a most enjoyable journey throughout these provinces to seek out the relics of the Moslem population that once predominated.

In 'Iraq, Islam is at home but not undisturbed, it would appear in this portrait, by fox-hunting Englishmen. Wishing to give us the best information on many different topics, the writers leave us somewhat confused and not so much the wiser about 'Iraq and the 'Iraqis of today as we had hoped to be. Little space, for instance, is given to the tremendous part played by oil in modern 'Iraq, though its effect on education is mentioned. Here, once again, Nuri es Said was quick to see his country's interests. The great irrigation scheme, Wadi Tharthar, is being carried out by English and German engineering firms working in harmony, which is still somewhat surprising to many of the inhabitants, but none the less encouraging for a scheme which plays a great part in the development on which their hearts are set.

Both these books are adequately illustrated, but they lack indexes, which is particularly regrettable in the case of that on 'Iraq. R. A. R.

ELEGANT FLOWER. By DESMOND NEILL. *London: John Murray*, 1956. $8\frac{3}{4} \times 5\frac{1}{2}$ *inches; 202 pages; map. 18s*

WHERE MONSOONS MEET. Edited by DONALD MOORE. *London: George G. Harrap*, 1956. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 279 pages; illustrations. 16s*

'Elegant flower' is a most useful and interesting addition to the very small and diminishing number of books about China. It is probably the last one to be written about the country before the Communists swept across it. The book is a record of adventure of a Malayan Civil Servant who was selected and sent to Amoy to learn Hokkien, the predominant Chinese dialect in Singapore. In consequence, the story is not by one who views the country through rosy spectacles. Mr. Neill has courage and initiative as well as an enquiring mind. In fulfilling his purpose to find out the background of the people who have migrated to Singapore, Mr. Neill undertakes quite hazardous journeys into an undeveloped interior and makes an excursion to Peking, the Great Wall, and Shanghai. The contrasts between conditions, customs and beliefs as well as the lack of any impact of the mid-twentieth century are amazing. The book is not wholly about China. Mr. Neill returns to Singapore before his examination and applies his new knowledge in the Chinese quarter and markets of Singapore. There, he not only begins to understand the people but also gains their confidence and friendship. Officialdom, however, seemed oblivious of the fact that there was more than one dialect of Chinese and posted Mr. Neill to an area where Hokkien was not understood. Mr. Neill's account is an effective lesson on how to understand the East. We must be grateful to him for recording that experience in an interesting and attractive book.

'Where monsoons meet' is an anthology of Malayan literature edited by an author of eastern travel books. Using the limited available material the editor has attempted to portray the story of Malaya and Singapore. That parts of his theme are weak is, in consequence, not unexpected. The earliest works are of value to the student of Malayan history while the authors of the past decade have really seen Malaya. Much seems to have been written about Singapore and Malaya but seen through the eyes of the less discriminating escorted tourist. Mr. Moore says that this anthology is a labour of love. It is useful in giving some background to a still little-known region. A comprehensive bibliography including some of the more scientific works might have made this a book of more permanence. P. J. T. B.

AFRICA

COLONIAL RESEARCH STUDIES. *London: Her Majesty's Stationery Office for the Colonial Office, 17 vols., 1950–55. Maps. Prices from 2s 6d to 32s 6d.* No. 15, TIV FARM AND SETTLEMENT. By PAUL BOHANNAN, 1955. *27s 6d.* No. 16 THE ECONOMY OF HAUSA COMMUNITIES OF ZARIA. By M. G. SMITH, 1955. *20s*

Two of the most recently published reports in the Colonial Research Series contribute much to our knowledge of Northern Nigeria. With the monographs of the

Ethnographic Survey of the International African Institute, recently reviewed in the *Journal* **121** (1955) 359, they cover some important areas of this vast territory, of which little has been written since the pioneer works of Dr. C. K. Meek and others twenty-five or more years ago. The two reports differ to no small extent in their approach and content. At the same time they are complementary, for each exemplifies one of the two major divisions that can be recognized in all anthropological, economic, demographic and human geographical studies of Northern Nigeria. Dr. Smith studied the total economy of Zaria Emirate, one of the Hausa-Fulani units of the "Moslem North." Dr. Bohannan writes of the farming and settlement of the Tiv-speaking peoples of Benue Province, the largest group in the ethnically fragmented and predominantly pagan "Middle Belt." The social and political contrasts between the two group studies is immense. Dr. Bohannan states that: "Tiv society is economically an egalitarian one. Wealth is measured by numbers of dependents, by industry, by prestige—not by resources or capital controlled. Clientage is not present among Tiv; neither is tribute nor status which is linked with economic inequality." In a broad generalization the conditions in Hausa society are the complete antithesis. The Zaria study shows that status and wealth are of the greatest significance, though they are not complementary: clientage is found in all strata of society with the power of authority, from the Emir down to village and ward heads. The personal budgets collected and analysed by Dr. Smith underline the very considerable measure of economic inequality.

Further contrasts between the two societies are of the greatest geographical interest. In the Tiv landscape there is almost a complete lack of settlement nucleation—"a people who have no towns;" in Zaria the Hausa live in large villages and towns, many of them with the remnants of their former protecting walls. Among the Hausa a comparatively high degree of economic development and specialization has led to the growth of an important system of markets with a wide range of trade contacts. In Tiv, markets are small, or generally absent, and a high degree of self-sufficiency is attained by the individual compounds. Married women among the Moslem Hausa have no public role, though they engage in certain economic activities which are reserved to them. Tiv women, on the other hand, control all foodstuffs except bullrush millet, besides undertaking specific agricultural tasks. This contrast is important in view of its influence on the supply of labour which presents one of the biggest problems of economic development among peasant communities in the tropics.

The methods employed by the two investigators in their field-work reveal an essential contrast between the two societies. Among the highly organized Hausa communities Dr. Smith used the technique of the controlled interview for obtaining essential economic information from individuals. He describes this as an unfamiliar anthropological technique compared with the usual one of ". . . participant observation and freedom to observe the daily routine of households" as used by Bohannan; and, of the two investigators, one feels that he came very much closer to the people whom he was studying and is thus able to identify himself with them in his writing. This is no reflection of personal attributes but was possible because the open and relatively unreserved Tiv allowed Dr. and Mrs. Bohannan to become a part of the community; a contrast, as the reviewer can testify, to the quiet, dignified, charming but enigmatic Hausa. At the beginning of his report Dr. Smith states clearly the standpoint from which an anthropologist undertakes a socio-economic study: ". . . whereas environmental conditions must be adequately treated to provide a background picture for peasant agriculture, craft and trade, equal attention must be paid to those factors and forces of political organization which controlled and integrated numerous localized agricultural groups into the wider territorial organization of the state."

The influence of social factors is, of course, to be considered also. One cannot help feeling, however, that though Dr. Smith began with the good intention of giving due consideration to physical and human factors this was not fulfilled. It is probably expecting too much that an anthropologist should consider them on an equal basis,

but "the environment" can hardly be said to have received reasonable treatment in the single page which is given to it in this report. Neither are environmental facts integrated into the general discussion, which in any case would be the most satisfactory method of including them.

Dr. Bohannan also dismisses the environment of Tiv with little more than a short stereotyped description, though in his discussion of the agricultural calendar reference is made inevitably to its integration with the march of the seasons. Geographers' eyebrows, however, will be raised when they read that: "Tiv geography is a paradigm of Tiv social structure: the lineage system and the genealogy which validates it." But if asked to defend this point of view, Dr. Bohannan would invoke the attitude of the Tiv themselves, who, he says, ". . . discuss the geography of their country . . . in terms of demography and social organisation."

They have no rigidly fixed boundaries (and ". . . are highly resentful of European-created boundaries"), members of a lineage segment have rights to sufficient land according to their needs, and increased requirements are met by a process known as "going to the farm." Either the individual or the kinship group expands at the expense of their most distantly related neighbour. Spatial relationships are therefore always changing. These conditions will appear strange to geographers unacquainted with communities like the Tiv; they certainly present awkward problems in the study of land use and of population distribution and density. It is safe to assert that they, and the problems they create, demand a particular approach and method for study by a geographer. The reviewer is convinced that there is much to learn from the anthropologists when developing such methods and approaches.

In the reverse direction, geographers will fully concur with the quotation in Dr. Bohannan's dedication that "Ethnologists should draw more maps." His efforts to obey this injunction are much appreciated for the way they illustrate the complex patterns of land ownership, land holdings and crops. Tables of land and crop acreages support the statements made regarding the varying pressure of population on the land in the two areas of Tiv in which he worked. As might be expected in an economic study, the tables in Dr. Smith's report are more extensive (some of those in the appendix are perhaps a little formidable); but here is essential basic data, so little of which is known, but which is of such vital importance. Geographers, particularly those working in the tropics, have much to gain from a study of these two reports and others in the series of Colonial Research Studies. R. M. P.

PREHISTORY AND PLEISTOCENE GEOLOGY IN CYRENAICAN LIBYA. By C. B. M. McBURNEY and R. W. HAY. *Cambridge University Press*, 1955. 10×7½ *inches;* xii+315 *pages; plates and text-figures.* 60*s*

The book is notable for the abundant and excellent field observation, both archaeological and geological. There is a rather rigorous division between Part I, Pleistocene Geology, by Dr. Hey, and Part II, Prehistory, by Dr. McBurney, which the reviewer will circumvent where possible. Valuable appendixes, a substantial list of references, and useful plates and text figures assist the reader. The text is primarily a study of raised beaches and continental deposits, of the excavation of caves, in which implements and remains of food-animals occur, in Cyrenaica; and of cultures, including the Neolithic, in a broader region.

The raised beaches, described in this review in their probable order of age, start with a high group, 140–200 metres above present sea level, which Dr. Hey attempts to fit into a European sequence by reasoning which appears tenuous to the reviewer. A substantial study of the south side of the Mediterranean, based on adequate use of readily available published information, might have been more constructive. Locally there are traces of shorelines below 90 metres, but their stated altitudinal ranges are considerable (70–90 metres, 44–55 metres, 35–40 metres, and 15–25 metres). The last seems to have Lower Palaeolithic implements associated with it.

A 6-metre shoreline is a distinctive feature, and Middle Palaeolithic implements are

assigned to it. It might have been well if the author had been content with statements of fact and substantial discovery instead of embarking on an excursion into world-wide correlation, involving considerable assumptions about relative altitude and fauna. Such mental exercises may be accepted by others as fact. Thus the reviewer would be loath to accept the author's dictum (pp. 64–5): "It cannot be doubted, therefore, that this high sea-level (*i.e.* the 6-metre shoreline) occurred at a time when the sea was warmer than it is at present. This means that it can only be placed either in the Last Interglacial or in one of the interstadials of the Last (Würm) Glaciation." The author has scarcely established an association of its fauna with that of the Mediterranean *Strombus* beach, and, for that matter, he explains in a footnote that recent evidence from south-east Ireland "raises the possibility that the 6–9-metre shorelines of Cyrenaica and elsewhere may, after all, have to be assigned to the Second-Last (Mindel-Riss) Interglacial."

The description of the continental deposits is admirable, although their relative order of treatment in the book needs to be understood. Those that can be dated are evidently younger than the 6-metre beaches. Calcareous tufas, with associated boulder beds and silts, in some of the wadis are thought to belong to one climatic episode and to be the oldest group. They are extremely interesting alike for their evidence of great spring-activity (and therefore of rainfall greater than that of the present day, however distributed seasonally), their associated molluscan and botanical remains (indicating probably hot summers and fairly cool winters), and a prolific Middle Palaeolithic habitation site (Hajj Creiem) with the remains of food-animals (an extinct buffalo, Barbary sheep, zebra, and a small tortoise).

Subsequently, when alluvial fans and terraces, large masses of rock-waste, and mud-flows were formed, the sea level had sunk below −17 metres. Consolidated sand dunes, some now below sea level, occur with these deposits, which are designated the Younger Gravels; Middle Palaeolithic implements are associated with the gravels. The nature and amount of rock waste leads the authors to assume that much of it was provided by frost action; a very cold climate, with moderate and seasonal rainfall, is postulated. Evidence of climate is drawn also from sites on the north side of the Mediterranean, which may be contemporaneous with the series in Cyrenaica, but to the reviewer it seems that the matter is yet hardly worth serious discussion on such grounds. Moreover, although the altitude of the Cyrenaican highlands is considerable and may have induced low temperatures in the past, there seems inadequate reason for regarding frost as a widespread medium of destruction in north-east Africa: the processes of semi-arid denudation, about which so much has been written lately, may afford an adequate explanation, and infer an environment in which coastal sand dunes might be expected. Incidentally, fossil coastal sand dunes, sinking below the sea and interbedded in Nile silt, and extensive Nilotic deposits, some implementiferous, passing northward below sea level, have long been known; they seem to have escaped attention in a context which might have been helpful to the authors.

The excavation of caves, notably Hagfet et Tera (previously investigated by Petrocchi) and Hagfet ed Dabba, by Dr. McBurney and his friends produced fascinating results. Upper Palaeolithic blade industries were found in stratigraphical order. The earliest was first identified at Hagfet ed Dabba; its first known occurrence, in the newly discovered site of Haua Fteah, has a radio-carbon reading suggesting a date close to 14,000 B.C. Traces of rhinoceros and antelope, ox or buffalo, zebra, gazelle, and Barbary sheep in comparative abundance, indicate the principal varieties of animal food. A second variant of blade industry was first recognized at Hagfet et Tera, and the radio-carbon age associated with it at Haua Fteah (where it occurs stratigraphically above the older style) is 10,000–6,000 B.C.; ox or African buffalo, zebra, Barbary sheep and abundant gazelle are the accompanying food-animals. Much is said about the typology of the blade industries, and, for that matter, of the Middle Palaeolithic industries, which must lie outside this review.

The next part of the book deals with pre-Neolithic implements found on the

surface and in deposits in northern Libya and adjoining territories: although some interesting points are made, the reviewer thinks that, if it were to be attempted in this book, so broad a subject and its literature would have been worth further treatment.

Finally the important chapter on the Neolithic strays far from Cyrenaican Libya. Primarily, it contains an instructive account of late-Palaeolithic to Neolithic industries in the Maghrab to the west (Capsian, Oranian, and Neolithic-of-Capsian-Tradition), and in Egypt. In the latter, where a considerable number of cultures, ending with the Predynastic, occur, the experts are perhaps not yet unanimous and angels fear to tread; to the reviewer it seems that the author treats Vignard's work at Kom Ombo in a rather cavalier manner. Collections in Cambridge, made around Siwa by Willet-Cunningham in 1918, and in northern and eastern Tripolitania by Perry, Sandison and Balfour-Paul in 1945–6, are described and analysed: reliance is placed on typology, among a litter of surface material, to detect significant trends and geographical distribution. Dr. McBurney concludes that defined Neolithic cultural provinces lay east and west of the Sirtican desert.

To conclude, this book seems to the reviewer to be at its best where it records new field work in Cyrenaica and purely factual accounts of stratified Neolithic and associated material veritably excavated by others farther afield. Human factors are bound to enter into the rest, whether Pleistocene climates or cultural relations; evidence or discussion may be faulty or partial, and in any event the subjects are advancing so fast that conclusions may be outmoded before they are printed. K. S. S.

BEITRAGE ZUR GEOGRAPHIE TROPISCH-AFRIKAS. By JOACHIM H. SCHULTZE. *Wissenschaftliche Veröffentlichungen des Deutschen Instituts für Länderkunde*. N.F.13/14. 137 *pages, maps*

This is a study of two large sections of tropical Africa. The first includes the lands of the west coast between French Equatorial Africa and the Gold Coast; the second is made up of Kenya, Uganda, Tanganyika and Ruanda Urundi. Although some comparisons and contrasts are drawn between the two areas, each is dealt with quite separately and systematically. Maps on a scale of 1 : 4 million have been carefully prepared to show the physical regions (*Landschaftsgliederung*), population density, agriculture, mining and mineral resources, communications, traffic intensity and final land assessment (*Zusammenfassende Bewertung*). The text is largely concerned with the sources and methods used in preparing the maps and with discussing the patterns they exhibit.

It is quite clear that this work was largely carried out before and during the War. The maps are based on data for 1926–39, and the bibliography, which lists more than 500 sources, lists only a few papers published since 1943. The whole paper is therefore out of date, but it might still have been of lasting value if it presented a reliable statement on the geography of the areas as they were fifteen years ago. In fact, it is necessary to assess the figures available in the 1930's in the light of recent, less inaccurate statistics before any reliance can be placed on them, and this is not done here.

The maps call for some criticism. On the population map of West Africa, the use of large units of area in Nigeria and small ones in the Cameroons produces a misleading contrast of settlement patterns. The method used to prepare the agricultural maps is worth studying but the results do not show very clearly the great variation in the intensity of land use over quite short distances which is so typical of inter-tropical Africa. The map of traffic intensity for 1936 gives no indication of the variation in intensity from one section of a railway to another; for Nigeria, the total traffic is distributed evenly over every mile of the country's railway system. Perhaps the most interesting maps are those which sum up, and show areas which are "active" and "passive" now, and areas expected to be active and passive in the future.

British geographers interested in Africa are not likely to find much more of value in this paper than in existing text-books. Its main interest lies in the manner of pre-

sentation. The lengthy, factual descriptions of what can be seen on the maps, and the way in which conclusions are drawn from rather superficial comparisons of distribution patterns, are both alien to current writing in this country. From almost every point of view this paper is an anachronism. A. T. G.

VISIT TO HAUTE VOLTA, 30TH JANUARY–3RD MARCH, 1955. By H. BRAMMER. Technical Report No. 9. *Gold Coast Department of Soil and Land Use Survey. Kumasi*, 1956. 13×8 *inches;* 50 *pages;* 2 *maps*

The author is one of several geography graduates on the staff of the Soil and Land-Use Survey Department of the Gold Coast. His visit to Haute Volta was made to gather information about run-off and erosion in the upper basin of the Volta which might have an influence on schemes for the lower river, and at the same time to compare the geomorphology, soils and vegetation of the territory with those of the Gold Coast. The report brings out many features which are beginning to seem typical of the West African interior.

Three main erosion surfaces are recognized. The oldest is developed on resistant rocks at elevations of about 2000 feet. (Remnants of older, higher surfaces, comparable with those of French Guinea and Nigeria, are lacking.) About 1000 feet lower, there is a more extensive surface which is the outcome of a multi-phase cycle in the upper Volta, but appears to be single phase in the Gold Coast. The present cycle is represented by a surface cut less than a few hundreds of feet below the preceding one. In detail it shows signs of alternating erosion and aggradation which probably result from climatic oscillations.

The latest episode, characterized by entrenchment and gullying in the headwater zone, is probably consequent on the clearing of woodland and increased run-off. The importance of accelerated erosion in the area is, the author admits, difficult to assess. Many of the gullies are probably quite ancient features of the landscape; extensive sheets of surface ironstone are largely natural. He suspects that some mottled soils have hardened as a result of erosion and that soil blowing is serious especially in the northern areas. His suggestion that accelerated erosion, in the case of many tropical soils, is not to be regretted is intended to be more than merely provocative.

In spite of the dryness, pedocals are lacking. This is explained by the strong downward leaching during the short rainy season when for a few weeks heavy precipitation exceeds evaporation losses. The nature of the soils has an important influence on the vegetation patterns, Guinea savannah extending north on the deep porous soils and the Sahel penetrating south along the heavier, impermeable ones.

The agricultural possibilities of the area as a whole are limited by the unfavourable rainfall regime, the general poverty of the soils, and distance from the coast. At present cultivation is limited to the lighter soils, amongst those soils derived from ancient dunes, and to rice growing in depressions. The aim of agricultural policy is to intensify farming in those relatively small areas which show signs of being economically productive.

In general the foreseeable developments in the basin of the upper Volta are of little significance for the lower river. The silt load may increase somewhat with the more extensive cultivation of cotton, and the regime of the river may be modified slightly if plans for irrigating the Sourou plains are put into effect. The considerable value of this report lies in its contribution towards explaining the physiographic links between geology and climate on the one hand, and soils and vegetation on the other. Its findings would be easier to assimilate if it included simple diagrams and sketches.

A. T. G.

PRIMITIVE CITY OF TIMBUCTOO. By H. MINER. *Princeton University Press (for the American Philosophical Society)*, 1955. 9½×6 *inches;* xix+297 *pages; map and illustrations*

This is a well printed, soberly bound book. The dust cover carries a photograph of a pretty African girl picking her teeth, and a very misleading title—'The primitive

city of Timbuctoo.' It might make a very handsome addition to the bookshelves of people who do not read, but feel that the imprint of a learned society in one of their volumes is evidence of culture. There is, in fact, no reference to the primitive city at all, though a study of the origins of Timbuctoo would be welcome. The author's researches into its history, and the summary comments he makes on conclusions not verified by facts or reading, extend no further back than to the period when, so far from being primitive, the city was already one of the past great centres of Islamic culture, some centuries indeed before "Euro-American civilization" (his phrase) had a chance to develop.

The historical chapter, a shallow little mine of misinformation, is however only a preface to the bulk of the monograph, which consists of a very detailed sociological analysis by, presumably, the methods inculcated in American classrooms, where anthropology is taught, of an ancient African city which has in recent generations been under French colonial administration. The second paragraph of the author's preface quoted in full will save further comment on the value of his evidence. "The material herein presented was derived through observation, intensive interrogation of six French-speaking native informants, and many interviews with natives through the medium of a French-speaking native interpreter. We did achieve some knowledge of Songhoi (*sic*) the native negro language and lingua franca of the city. We did not know the totally unrelated Arabic and Temajegh languages which were also native to large segments of the population. Even though participation in the native life of Timbuctoo could not be achieved, contact with the small French colony was studiously avoided. The result was that while we were never considered citizens of the native city, we were more in the confidence of the natives and had a greater entrée into their activities than did the French." The only other comment which could be added appropriately is that the "French-speaking interpreter" obviously from the terms used only spoke "Petit-Nègre."

Such a paragraph at the beginning of the book is hardly likely to encourage anybody to read the rest of it, at best a formidable undertaking in view of the idiom affected by its writer. The portentous equipment of sociological jargon diluted by the very thin gruel of what he serves up as data, is not easily digestible. It is very hard to swallow it all, and one may still suffer from a particularly insipid lump, which is the chapter on the Moslem faith.

Nevertheless, the book has a certain value for anthropologists of courage and determination, who are interested in a transatlantic approach to learning, and its influence on the rapid development of conformity as a social idea: the style is catching! The most superficial symptoms of the homogenization of ethnographically heteregeneous out-groups by conurbanization into an Euro-American taboo structure, that is, the ready assimilation of semantic clichés without intellective content, is here most conspicuously demonstrable (I said the style was catching). Compulsive behaviour patterns unanimously adopted are of course subsequent to and consequent upon these semantic formulae. There are, however, less arduous approaches to this study than Mr. Miner's book. P. R.

LAND AND PEOPLE IN NIGERIA. By K. H. Buchanan and J. C. Pugh. *University of London Press*, 1955. 10×7½ *inches;* xii+252 *pages; maps and illustrations.* 35*s*

This first detailed geography of Nigeria has been written by two former members of the Geography Department of the University College, Ibadan. It is a comprehensive, reliable and well-produced book. It includes nearly 200 maps drawn by the authors, many of them models for other geographers to emulate. They present a great deal of statistical information in a concise and easily assimilable form, but their number is excessive. In some of the maps the use of administrative divisions and provinces as units for plotting distributions is liable to be misleading, because several of them in the north are so large as to conceal much internal variation and to

suggest comparisons and contracts which do not in fact exist. The photographs and the sketches of land forms, craftsmen at work, settlement patterns and land use are admirable.

The first section, entitled "The environmental setting," describes the geology, relief, climate, vegetation and soils, and includes a contribution by Professor A. Brown, Dean of the Faculty of Medicine at Ibadan, on disease in Nigeria. The human pattern, agricultural economy, forest resources, mining and industry, public and social services are treated in the succeeding sections.

On the whole this is a factual survey, and the views expressed are not highly controversial. The sections on relief and drainage include no more than hints of the theories concerning their evolution that have been put forward by Dr. Pugh in recent papers. There are nevertheless some points on which this reviewer would disagree with the authors. For example, in the Middle Belt it is unlikely that the expansion of the Tiv people has ceased (p. 63); and, so far as it is known, the mineral wealth there is not very great. This region appears to be at least as complementary economically to the south as to the north (p. 95). In the concluding chapter on "The future," which is only two pages long, less emphasis might well have been placed on the need to diversify cropping, and more on the need to improve communications to allow each part of the country to concentrate on producing those things for which it is best adapted physically.

Events in West Africa are moving rapidly and it is hardly possible for authors and publishers to keep up with them. Some of the agricultural development schemes mentioned here have already become experimental projects and the mileage of tarred roads has increased very greatly since 1950 (Fig. 159). It is most unfortunate that it was not possible in this book to make full use of several important sources of information, such as the reports on the population census and the census of agriculture that have appeared since 1952, and that some of the maps and statements in the text are based on inaccurate figures, dating in some cases as far back as 1931. Nevertheless the basic patterns which appear are correct, and this is a valuable contribution to the geography of Africa. A. T. G.

EUROPÄER IN OSTAFRIKA, Klimabedingungen und Wirtschaftsgrundlagen. By ERNST WEIGT. Kölner Geographische Arbeiten Vol. 6/7 1955. *Geographisches Institut der Universität Köln.* 385 *pages;* 37 *maps and diagrams,* 30 *photographs* (*English Summary*). *DM.*12.50

When about twenty years ago the late C. Gillman reviewed E. Weigt's first thesis ('Die Kolonisation Kenias,' Leipzig, 1932) for this *Journal*, the review was not published because of possible political repercussions among the European settlers in Kenya. Since then rapid developments have taken place in nearly all territories in East Africa, so that a critical geographical analysis and appraisal of European achievements since the beginning of this century is of considerable interest.

The work is divided into two main parts: first, there is a comparative investigation of the interaction of climate and the white settler in the highlands of East Africa, including a climatic analysis of the more important settlement areas, and chapters on the problem of acclimatisation. This section also includes a description of the population structure, labour questions and the economic pattern. The second part deals with the regional differentiation of colonization and white settlement. The emphasis here is on Tanganyika, where the author lived for several years. At a time when new arrivals in East Africa have often to buy experience at a high price the account of the difficulties of past settlers has a very practical significance. One of the most important assets of Weigt's research is that he has tried to preserve the store of experience of a generation of German planters who lost their property twice, after the first and second world wars.

As the title suggests, the study is viewed mainly from the standpoint of the European settlers' success and failure as controlled by climatic, ecological and economic factors.

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The economic contribution of the African and Indian remains in the background. Professor Weigt should be encouraged to deal in similar detail, some time in the future, with the "junior partners" of East Africa's multi-racial society. There is, for instance, as yet very little real evidence whether the African is less or more adaptable than the European to various conditions of heat, radiation and humidity.

Author and editors on the staff of the Institute of Geography in the University of Cologne may be congratulated on this publication which is written in the best geographical tradition. W. M.

REPORT ON AFRICA. By ODEN MEEKER. *London: Chatto and Windus*, 1955. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 331 pages; map and photographs.* 21*s*

The dust cover of 'Report on Africa' shows several extremely large and nearly naked Africans dancing energetically away in the streets of Johannesburg. The photograph is striking but its use is somewhat inappropriate, partly because South Africa is one of the few territories which Mr. Meeker, an American journalist, did not visit during his twelve months' journey, and partly because his book is not the run of the mill travel story which the cover might lead one to suppose. 'Report on Africa' is in fact one of the best introductions to much of inter-tropical Africa which the reviewer has read in recent years. There are chapters on Dakar and French West Africa; Dahomey; Liberia; the Gold Coast; Nigeria; the Belgian Congo and Ruanda Urundi; French Equatorial Africa; the Portuguese and Spanish colonies of the west coast; Mozambique, Tanganyika and Zanzibar; Kenya; Uganda; and Ethiopia. None of these countries is dealt with exhaustively—to do so would be quite outside the scope of a book of this kind—although some, notably Nigeria and the Belgian Congo, receive fuller treatment than others. Mr. Meeker has naturally concentrated on the places he himself has visited, mainly the larger towns, and on the problems of the moment. Thus the chapter on Uganda confines itself largely to the kingdom of Buganda, and that on Kenya to a discussion of the Mau Mau movement. Current problems are put in perspective by a brief account of the history of each territory.

The value of 'Report on Africa' lies in its quite remarkable accuracy, in the author's sense of proportion, and in his ability to capture the feel of each territory he visits. His descriptions of the countryside and of people are vivid, and he has so much of value to say that, unlike many other travellers in Africa, he is not compelled to rely on a series of big game stories to hold the reader's attention. One can only hope that Mr. Meeker will soon find an opportunity to visit and report on South Africa and the Central African Federation. J. M. R.

CENTRAL AMERICA

THE RISE AND FALL OF MAYA CIVILIZATION. By J. ERIC S. THOMPSON. *London: Gollancz*, 1956. $8\frac{1}{2} \times 9\frac{1}{2}$ *inches; 279 pages; plates and figures.* 30*s*

We are apt to think of indigenous American civilizations in terms of the Incas of Peru or the Aztecs of Mexico, the former a totalitarian theocratic bureaucracy, and the latter a barbaric state obsessed with blood and human sacrifice. But there was an intellectual and artistic side to all the ancient civilizations of the New World, and we could probably say that the greatest achievement in these spheres was attained by the Maya. Eric Thompson, who has devoted a lifetime to the study of Maya archaeology, is the greatest English specialist in the subject since Alfred Maudslay, whose explorations between 1881 and 1894 were of such outstanding importance; Maudslay was Honorary Secretary of the Royal Geographical Society from 1916 to 1928. Mr. Thompson has now given us an extremely stimulating and readable account of the history and civilization of the Maya from beginnings no different from those of the other Middle American cultures, through the so-called classic period (that of their greatest artistic and scientific attainments) lasting from 230 A.D. to their decline round about 890 A.D.; through a period of subjugation to Mexican invaders; and their final

disintegration into warring city states which survived till their conquest by the Spaniards.

The greatest achievements of the Maya were in the realms of astronomy and mathematics. In astronomy they had determined by observation the length of a lunation as 29 days; of the solar year as 365 days; and the length of a revolution of the planet Venus as 584 days. Unable to use fractions, they made corrections to equate their observed results with their calculations. In mathematics, which served their astronomy just as their astronomy served their religion, they had devised a vigisimal system with positional notation and a concept of zero. At frequent intervals they inscribed their calculations on stone monuments, using them, *inter alia*, for divinatory purposes. One calculation carried their speculations back the astronomical distance of four hundred million years.

It is interesting to notice that the greatest advances in the arts and sciences were made, not in Yucatan or in the highlands of Guatemala, both reasonably accessible to outside influences, but in the lowland forest areas of the Peten and of British Honduras. It is as though progress depended on freedom from outside influences, from rival religious beliefs, and from the distraction of warlike contact with their neighbours.

Perhaps the most important contribution the author makes is his suggestion that the decline of the Maya was due to a revolt of the peasant farmers who found the religious and astronomical activities of the priesthood not only completely beyond their comprehension but had little relation to their elementary spiritual and material needs. In the absence of written history for all except the very end of the story this book cannot be an account of personalities and policies. It is an interpretation of archaeological facts which does not suffer in scholarship by being readable and popular.

A. D.

AUSTRALASIA

WILD LIFE OF AUSTRALIA AND NEW GUINEA. By CHARLES BARRETT. *London: William Heinemann*, 1954. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xi+229 *pages; illustrations.* 21*s*

The wild life of Australia is of special interest to naturalists since this region has had no land connection with the rest of the world since the beginning of the Tertiary Epoch and comprises a large number of so-called "living fossils" which have remained almost unchanged throughout that era. The author does not attempt any scientific account of the subject but gives an interesting popular narrative—accompanied by many true stories and anecdotes of the living creatures to which he refers. The book also includes an account of some of the wild life of New Guinea, the land of paradise birds, and of New Zealand with its highly specialized bird life. To anyone interested in the protection of nature the accounts of the destruction of the wild life in these regions makes very sad reading. The deliberate introduction of pigs and goats and later of horses, cattle and sheep, in the latter part of the eighteenth and the first part of the nineteenth century, combined with the accidental introduction of rats, mice, cats and dogs, has had a disastrous effect on the native animals and plants. The rabbit, which became a major pest towards the end of the nineteenth century, was followed by a succession of other mammals—ferrets, mongooses, and even foxes, introduced with the idea of controlling the rabbit population, but finding the native fauna a much easier prey. Sportsmen and pot-hunters have helped in the near extermination of much of the game including some of the finest pigeons such as the bronze-wing and Wongawonga, which used to occur in immense flocks; and the mass exportation of cockatoos and parrots has resulted in the virtual disappearance of such species as the night parrot and ground parrot, though the latter still exists in very small numbers. In the chapter devoted to mammals of the sea, is included the history of "Pelorus Jack" a famous white dolphin with the habit of following vessels that entered waters near the French Pass of New Zealand, which had been known to the Maoris for very many years. The birds comprise such amazing examples

as the incubator birds—the brush-turkey, the scrub fowl and the mallee fowl—all of which build elaborate mounds in which the eggs are incubated.

The author includes chapters on reptiles, amphibia, fishes and insects. Among the latter there is a meridional termite in tropical Australia which builds "magnetic anthills" whose ends always face north and south. These and many other wonders are described in an attractive manner, and this book with its excellent illustrations can be recommended as a good popular account of the subject. E. H.

POLAR

ANTARKTIS. By HANS-PETER KOSACK. *Heidelberg: Keysersche Verlagsbuchhandlung*, 1955. 6×9 *inches;* 310 *pages; maps, diagrams and plates. DM.*27.80

This volume follows the general plan of the series, "Geographische Handbücher," which is to present an up-to-date, objective study which will interest not only the geographer but the businessman, the journalist, and the general reader. To this end, it opens with a summary of Antarctic history, in which the various national claims to territory are quite fairly set out. This is followed by chapters on the physical, biological and economic aspects of the continent as a whole. Studies of the various island groups and regions are then attempted as far as present knowledge permits. The author appears, with a few exceptions, to have taken account of the available literature. Harrison Matthews' 'South Georgia' and A. R. Hinks' paper on Antarctic history, however, seem to have escaped his notice; also the Scientific Reports of the Falkland Islands Dependencies Survey and of the British Graham Land Expedition. Much information is given in the form of tables; the list of expeditions has been done with care and includes the names of the principal participants. The choice here is not always the most appropriate, and there are a few misprints, not surprisingly with so many varied surnames. In view of the interest in the Antarctic aroused by the International Geophysical Year, there is undoubtedly a demand for a compact reference work of this type. G. R. C.

GENERAL

THE TEACHING OF GEOGRAPHY. By G. H. GOPSILL. *London: Macmillan*, 1956. $8\frac{1}{2}\times5\frac{1}{2}$ *inches;* 316 *pages; plates and figures.* 25*s*

This volume is a useful addition to the still rather limited range of substantial books devoted to the teaching of school geography. Mr. Gopsill adds to his experience as a teacher the more objective outlook of a lecturer in education and bases the teaching he advocates upon a sound psychological and methodological foundation. Beginning with a discussion of the nature and scope of school geography, he goes on to deal with local geography, map work, classroom methods, visual and other aids, syllabus planning and the geography room. The first chapter on geography as a school subject is, though short, an interesting preliminary. (It is a pity that Mr. Gopsill's book was prepared too early to make reference to the Society's admirable report, 'Geography in Education.') The author then faces up to practical problems, going into detail when describing methods besides giving a number of full expository accounts of specimen lessons.

Mr. Gopsill has many useful things to say about sketch-maps, but he does not emphasize that the essential implications of a sketch-map must be correct or it fails in its purpose. There is something gravely unsatisfactory about the sketch-map, Figure 30, which locates both Buenos Aires and Monte Video many miles from the Plate estuary and again with Figure 31, which shows the "firm ground" on which presumably London was established as some 7 or 8 miles from the Thames. Nor can the latter map properly be described as illustrating "the site of London."

It is rather curious that, with field work receiving increasing attention in schools, this topic does not appear in the index. It is true that Mr. Gopsill does not ignore field work; he lays emphasis upon it in the early stages and again in connection with

school journeys, but there is no explicit reference to it in the section dealing with the planning of the secondary school course. At the same time it should be said that Mr. Gopsill lays great store by observation, realism and variety of approach in geography teaching.

The scope of the book ranges from the teaching of "young children" (Mr. Gopsill properly stresses the importance of giving these an invigorating introduction to the subject) to that represented by the Ordinary Level of the General Certificate of Education. It presents so many examples and so much detailed exposition as to be specially useful to the teacher of geography with a few years of experience who is seeking to widen and vary his methods and has some basis for evaluating the directions of a vigorous guide. The references to further reading, the considerable classified bibliography and much technical and other information connected with visual aids are notable features of the book. L. S. S.

SOME RECENT ATLASES

A somewhat unusual number of atlases have been published recently in Britain and abroad. The following, which are now in the Society's collections, are representative of the various classes. While on the whole they keep rather close to well-established conventions, they in general serve the purposes for which they were designed, and they include some good examples of modern offset colour printing.

The 'Atlante internazionale' of the Touring Club Italiano has for long been recognized as among the best library reference atlases, and the edition published to mark the sixtieth anniversary of the Club's foundation will be welcomed (20 × 14 *inches;* 173 *plates. Milano,* 1955–56). The sheets are issued in fasicules, to be inserted in a strong spring binder. The plates have been increased, and will now number 173. There have been no radical changes in style; relief is almost entirely in light buff hachures, and emphasis is placed on political and administrative divisions, outlined by ribbons of colour. It is not easy to form a precise idea of the relief from the maps, though spot heights, generally on summits, are fairly frequent. Most of Europe and the United States are covered at the scale of 1/3M; parts of Italy are on scales as large as 1/250,000. All the projections employed are named and the usual close attention has been bestowed on the rendering of place names. With an index which will have around 200,000 entries, this is a comprehensive work of reference.

Volume IV of *The Times* Atlas, the second to be published, contains Plates 73–96 covering southern Europe and Africa (19½ *inches;* 24 *double-page plates;* edited by John Bartholomew, 1956, £5 5*s*). The general style was discussed at some length in the *Journal* in a review of Volume III (*Geogr. J.* **121** (1955) 208). The arrangement of this volume does something to preserve the unity of the Mediterranean, particularly of its eastern portion. The standard of the maps as a whole appears higher than in the earlier volume, and some are particularly attractive. (The map of Madagascar, however, is an example of how not to letter a map.) Layer colouring, as is well known, is least effective for extensive areas with little variation in altitude, as is the case here with large areas in Central and South Africa. In contrast to these, there are attractive sheets of northern Africa, with sand-dune areas, rock escarpments, craters and salt marshes neatly indicated. The main point about the African sheets, however, is the large scales on which they are drawn: in no other atlas could the Nile delta and Sinai at 1/1·25M or Kenya and Uganda at 1/2·5M be found. It is interesting to compare the North African sheets with those of the 1922 edition and to note what progress in knowledge and mapping has been made in the intervening three decades. In some instances, events have been anticipated, for a conspicuous feature of one sheet is the Kariba dam and "proposed reservoir." It is convenient to have maps of Gibraltar, Malta and other islands on an adequate scale, as well as plans of the capital cities. One or two small points require correction. There appear to have been some amendments to the provincial boundaries of Kenya, *e.g.* in Southern and Tana River

Provinces, which are not incorporated. The nomenclature of the sub-provinces of Portuguese East Africa does not quite conform to the official usage. (These two points apply also to Philip's Reference Atlas—with more force in the case of Kenya.)

'Goldmanns Grosser Weltatlas' has a varied history (16×11½ *inches;* 125 *maps. München,* 1955). Based on an atlas privately published by an American firm some three years ago, the maps were compiled and printed by De Agostini of Novara, and the text has been translated into German, checked and amplified, and the whole published at Munich. The maps, except perhaps those of areas with higher and more broken relief, are pleasantly toned and clean: all the maps show relief by layer colouring, supplemented by hachuring and oblique shading which is relatively heavy in the high altitudes. The scales employed are naturally related to the nationalities of likely users of the atlas: central and eastern Europe is covered at the scale of 1/1M and the remainder of Europe at 1/2·5M. A considerable part of South America is on the scale of 1/5M, but the sole map of Australia is 1/10M. Well-known town and city names with German versions, are entered under the German form with the local in brackets; generic topographic and administrative terms are also translated into German. A special feature of the atlas is the supplementary maps, diagrams and tables printed in the margin or on the reverse of the maps; these cover racial distributions, land use, economics, history, etc., so that the volume is also a graphic geographical encyclopaedia. The index includes approximately 100,000 entries.

Private cartography in Spain, as the introduction to the 'Atlas Universal Aguilar' remarks, has recently fallen somewhat behind the highest international standards, and this is a carefully thought-out effort to produce a new and comprehensive atlas for Spanish-speaking peoples (16×12 *inches;* 115 *plates of maps. Madrid, Aguilar,* 1954). It is, to be exact, rather more than an atlas, for it contains a text on geography, general and regional, and a very large number of illustrations in photogravure. The maps are designed to give detailed coverage to areas of interest to the Hispanic world—Spain is on the scale of 1/1M, and South America on 1/5M. The layer coloured physical maps are clear and pleasant, but some of the general maps, particularly those on a small scale, tend to be overcrowded with names and other details. The nomenclature has been dealt with in a reasonable way—with concessions to Spanish readers in the translation of generic terms, *e.g.* in Canada, 'Lago Superior,' and 'Golfo de San Lorenzo'; but for cities alternative forms, *e.g.* Moskva (Moscú) are given.

Philip's latest atlas, put forward as an entirely new work, is in the main intended for locating places, though there are some general introductory maps and layer coloured maps of each continent (15½×10 *inches;* 120 *plates.* 1956. £5 13*s* 6*d*). The principal maps do not indicate relief visually, though there are spot heights on most sheets; political divisions are shown by solid colour, with main roads and principal airports in red. The political and administrative colouring certainly makes the divisions clear—they are often very difficult to pick out on other maps. The lettering is in general clear, though there is considerable variation in the style of some sheets. The coverage is quite detailed; the greater part of Europe, for example, being covered on the scale of 1 inch to 32 miles approximately. The provinces of Kenya are incorrectly shown in this atlas. There is an index with 90,000 entries.

The 'Mercantile Marine Atlas,' a considerably older publication by the same firm, appears in its fourteenth edition, the first since 1935 (20½×15½ *inches;* 38 *double-page plates.* 1952 (1955). £12 12*s*). The atlas is designed for "merchant shippers, exporters and ocean travellers." The twenty-five large charts on Mercator's projection show the shipping routes between the ports of the world, with distances and other information. These routes are said to "correspond with the courses followed," but no seasonal changes seem to be indicated. Railway connections between ports and their hinterlands are shown, and there are inset plans of the principal sea ports of the world.

A work of rather a different character is 'The Atlas of Western Civilization' (13½×10 *inches;* 54 *maps; illustrations. Elsevier Publ. Co.,* 1954). The maps in

colour are designed to present a particular epoch or aspect of European cultural history, emphasizing centres, frontiers, points of contact and intellectual currents. To a considerable extent, for the earlier periods and for subjects such as the spread of an architectural style, it is successful, but a plate like "Romanticism and Positivism 1814–1875" does not convey anything as a map. Considering the length of the text, it succeeds in being lively as well as informative, and is reinforced by one thousand photogravures illustrating art history. This is a fascinating volume to browse through.

At the lower end of the scale, as far as size and price are concerned, is the Penguin Atlas (8×5½ *inches;* 80 *pages of maps.* 1955. 10*s*). This, an English version of a Swedish production, forms a handy pocket atlas. The clearly printed maps are mostly locational and administrative; the physical maps of the continents are not very successful. Bearing in mind that at these scales (most of Asia is on the scale of 1/20M) a severe selection of place-names must be made, it gives a reasonable choice—the index contains 15,000 entries. G. R. C.

RECENT TRAVEL BOOKS

The most entertaining chapter in Olle Strandberg's JAMBO (*Michael Joseph*, 1956, 18*s*) is the one on African islands, those odd pawns in bygone political games, which lie scattered and, for the most part, forgotten across the Indian Ocean. Mr. Strandberg is an experienced traveller-writer, adept at observing relevant details and at sensing an atmosphere. His political judgments are often trite, but his stories are first class, and he is modest withal. Major W. T. Blake is an equally enterprising and cheerful traveller, but THAILAND JOURNEY (*Alvin Redman*, 1955, 25*s*) is to be read more for its spirited account of a little-known country, than for stylistic embroideries. Even for such seasoned travellers as Major and Mrs. Blake, the journey to the furthest corners of Siam was strenuous and at times dangerous. The book is illustrated with fine photographs, many of them in colour.

Major Blake was too occupied in nursing his Standard over jungle tracks and through rivers to consider too deeply the past history of his surroundings. Mr. Donald Hall, in a Fiat in the Abruzzi, broods (though never morbidly) on the wrongs done to Italy through the centuries by recurrent invasions (EAGLE ARGENT. *Methuen*, 1956, 16*s*). He began his journey, in a spirit of expiation, at Monte Cassino, and has much of interest to say on the traditions and influence of the Benedictines. Not that 'Eagle Argent' is an unduly sombre book; Mr. Hall, who knows Italy and speaks Italian well, had many amusing encounters, and performed some good turns on the road—for instance, in driving back to their respective homes two grandmothers who had outstayed their welcome at one of his ports of call. Mr. Anthony Rhodes is another good writer of travel books who loves Italy, as shown by 'A Sabine journey' of some years ago. It must be confessed that THE DALMATIAN COAST (*Evans*, 1955, 12*s* 6*d*) is something of a disappointment, which is perhaps to be blamed on its being one of a series, the publishers' useful "Windows on the World." Illustrations are good, and it should make a serviceable guidebook. In the way of guidebooks proper, a new volume in Ernest Benn's Blue Guides is to be welcomed. ROME AND CENTRAL ITALY (*Benn*, 1955, 42*s*) is up to the usual standard of readability and accuracy; it includes a complete atlas of the area, town maps and plans of antiquities.

Nothing could be further from a book in a series than Dr. F. Fraser Darling's PELICAN IN THE WILDERNESS (*Allen and Unwin*, 1956, 25*s*). Dr. Darling, the well-known ecologist, visited America in 1949 and 1950, studying the varied natural scene and learning something of American methods of conservation. In 1952 he went to Alaska on an ecological reconnaissance with the American naturalist Starker Leopold. Dr. Darling's subject is so vast—nothing less than man's use and abuse of his natural environment since the beginning of time—that his very long book is not easy to read, but it is worth persevering for the sake of much interesting information and for some

idyllic descriptions. The author was particularly impressed by the way of life of the Hopi Indians in Arizona, and moved to rapture by the unspoilt beauty of certain tracts of high sierra and of forest country in California. Dr. Darling is surely the least cerebral of scientists, and the emotion with which he deplores man's misuse of his natural environment recalls Blake's agonized contemplation of a "skylark wounded on the wing." To conclude this review, a very fine collection of photographs is to be recommended—INDIA (*Thames Hudson*, 1955, 42*s*) by Richard Lannoy. Like many visitors before and since, Mr. Lannoy is struck by the contrasts of the sub-continent: that in theory Hinduism is a religion of the mind, in practice often a cult of the body; that great poverty and great splendour exist side by side; that despite "the exuberance of detail in India . . . a deeper sense of order underlies the richness of the surface." The pictures, six of them in colour, were taken during an eighteen-month tour through south India, Rajputana, Bengal and the foothills of the Himalaya. A chronological table and a map give body to this handsome book. D. M.

A SELECTION OF SOME 900 BRITISH AND IRISH MOUNTAIN TOPS. Compiled and arranged by WILLIAM MCKNIGHT DOCHARTY. *Darien Press, Edinburgh*, 1954. 7½ × 10 *inches; 124 pages; illustrated by 9 panoramas.*

This book has been privately printed in a very limited edition, and a copy presented to the Library by the author. The author wishes to make available to his friends the researches which have guided his extensive mountain rambles in the various ranges of these islands, and he has listed hundreds of mountains of less than 3000 feet in height, giving their heights and map references. A fine collection of panoramic photographs taken by the author is bound in at the end of the book, with full photographic and topographic details; two are Irish and the remainder are Scottish panoramas.

The introduction explains how the author came to compile the lists. He might with advantage have added a chapter or two describing in some detail a selection of the most interesting peaks of medium height. A few are familiar enough—Stac Polly and Suilven, for instance, which appear in the frontispiece, are little mountains of great character which most of us try to visit; but many are less well known; in the Lake District, for instance, Harter Fell, and in Snowdonia, Cynicht come to mind as lesser and remote peaks of great merit for a discerning rambler. Without a commentary of some kind the book remains something of a mountain Bradshaw, of interest to those who believe in the "Munro doctrine," whose ambition is to conquer everything they can find on a map, of a given altitude, however remote it may be. H. R. C. C.

THE SOCIETY'S NEWS

THE OFFICERS AND COUNCIL OF THE SOCIETY

Following the Annual General Meeting on 18 June 1956, Professor L. Dudley Stamp becomes a Vice-President in place of the Bishop of Portsmouth, who becomes a Trustee. Of the five new members of Council, four will serve for the first time, namely Captain W. H. Coombs, Professor W. G. East, Sir Christopher Summerhayes and Lieutenant-Colonel G. E. Wheeler. Professor A. Austin Miller, Professor of Geography at the University of Reading, last served on the Council from 1943 to 1948.

Captain W. H. Coombs is President of the Officers (Merchant Navy) Federation which he helped to found in 1928. Professor W. G. East has been Professor of Geography at Birkbeck College in the University of London since 1947. Sir Christopher Summerhayes was until recently British Ambassador in Nepal; his tenure of office coincided with the successful British expedition to Mount Everest in 1953, to which he and his staff gave much valuable help and hospitality. Lieutenant-Colonel G. E. Wheeler has been Director of the Central Asian Research Centre since 1953; he served for many years in India, Central Asia and the Middle East, and is chairman of, and one of the Society's representatives on, the Permanent Committee on Geographical Names which is established in the Society's House.

THE RECORD

CONTRIBUTORS TO THIS ISSUE OF THE *JOURNAL*

Miss Freya Stark, the distinguished traveller and author, received the Back Grant in 1933 and the Founder's Medal in 1942, for her travels in Arabia; she has recently been exploring the ancient cities along the western and southern coast of Turkey. *T. H. Elkins*, lecturer in geography at King's College, London, was stationed in Germany after the end of war in Europe to December 1947. *W. W. Williams* is lecturer in geography and surveying at Cambridge. *G. W. Murray*, Gold Medallist in 1936, was for many years Director of the Topographical Survey of Egypt. *Professor J. A. Steers* is Professor of Geography at Cambridge, and *Dr. D. B. Smith* is on the staff of the Isotope Division, Atomic Energy Research Establishment, Harwell. *S. Gregory* lecturer in geography in the University of Liverpool, is a Fellow of the Royal Meteorological Society. *J. P. Cole*, who specializes in Russian studies, has been for a year a reader in geography at Reading, and is taking up an appointment at his own university of Nottingham in September. *Professor C. A. Cotton*, Emeritus Professor of Geology, Victoria University College, New Zealand, is a Victoria Medallist of the Society, and was recently awarded the Dumont Medal by the Geological Society of Belgium for studies in geomorphology.

UNIVERSITY NEWS

UNIVERSITY OF LIVERPOOL

Mr. R. W. Steel, lecturer in colonial geography at Oxford University, has been appointed to the John Rankin Chair of Geography in the University of Liverpool, left vacant by the death last September of Professor Wilfred Smith. Mr. Steel was a member of the Society's Council from 1949 to 1953 and in 1948 received the Murchison Grant for his part in the Ashanti Social Survey.

UNIVERSITY OF DURHAM

The appointment is announced of Dr. W. B. Fisher, at present reader in geography in Durham University, to be Professor of Geography in the Durham Division of the University. Dr. Fisher, who came to Durham from Aberdeen in 1954, has a particular interest in Mediterranean problems.

THE PERMANENT COMMITTEE ON GEOGRAPHICAL NAMES

At its last meeting on 16 May 1956 the Committee approved the following statement of its organization and functions:

The Permanent Committee on Geographical Names for British Official Use (P.C.G.N.) was set up in 1919, at the suggestion of the Admiralty, to study and advise on problems of geographical nomenclature. The need for such a body became apparent to official mapping authorities during the First World War. The Committee produced successively a revised conventional alphabet (the R.G.S. II system), a handbook of transliteration systems ('Alphabets of Foreign Languages') and a guide to the use of conventional and local official forms of names (in its Lists, 1921–37).

The Committee greatly increased its activities between 1939 and 1945, and the continuing importance of its work in this specialist field was recognized in 1947, when it was agreed that the operations of the Committee should be supported by a grant from public funds. Provision was made for the establishment of a permanent staff and for the resumption of the Committee's publications in a revised and expanded form.

Since 1945 the need for uniform systems of transliteration has come increasingly to the fore, notably in the English-speaking countries. In addition the question of the international standardization of geographical names throughout the world is now being studied by the United Nations. In regard to these wider, long-term aspects of the problem the Committee works in close co-operation with the United States Board on Geographic Names.

Details of the Committee's constitution and functions are as follows:

1. The Permanent Committee on Geographical Names for British Official Use is an advisory body composed of representatives of the Admiralty, Colonial Office, Foreign Office, Ministry of Defence, War Office, Ordnance Survey (Ministry of Agriculture, Fisheries and Food), Ministry of Transport and Civil Aviation, the Post Office, the Royal Geographical Society, and the Royal Scottish Geographical Society.
2. The Admiralty is responsible for the administration of the grant made from public funds towards the maintenance of the Committee.
3. The Committee is under independent Chairmanship, and meets at regular intervals.
4. Its permanent staff is accommodated in the house of the Royal Geographical Society, and the Imprest Account is held by the Director and Secretary of the Society acting for this purpose as the agent of the Admiralty.
5. Its principal function is to advise British official mapping and charting authorities on the writing of geographical names, excluding those of the United Kingdom. It also studies and advises on international aspects of geographical nomenclature.

   It develops and keeps under review principles of geographical nomenclature; it recommends, and where necessary, devises systems of transliteration and transcription; it takes account of linguistic problems arising out of changes of sovereignty and administration; it records information about foreign orthography and geographical terminology; it corresponds with Commonwealth, foreign and international organizations concerned with relevant problems.
6. It prepares lists of approved geographical names in countries and regions overseas, and glossaries of foreign geographical terms, copies of which are on sale to the public.

7. It refers technical questions to sub-committees on which the Departments directly interested and the authorities on the subjects to be discussed are appropriately represented.

GEORGE W. HAYWARD, GOLD MEDALLIST, 1870

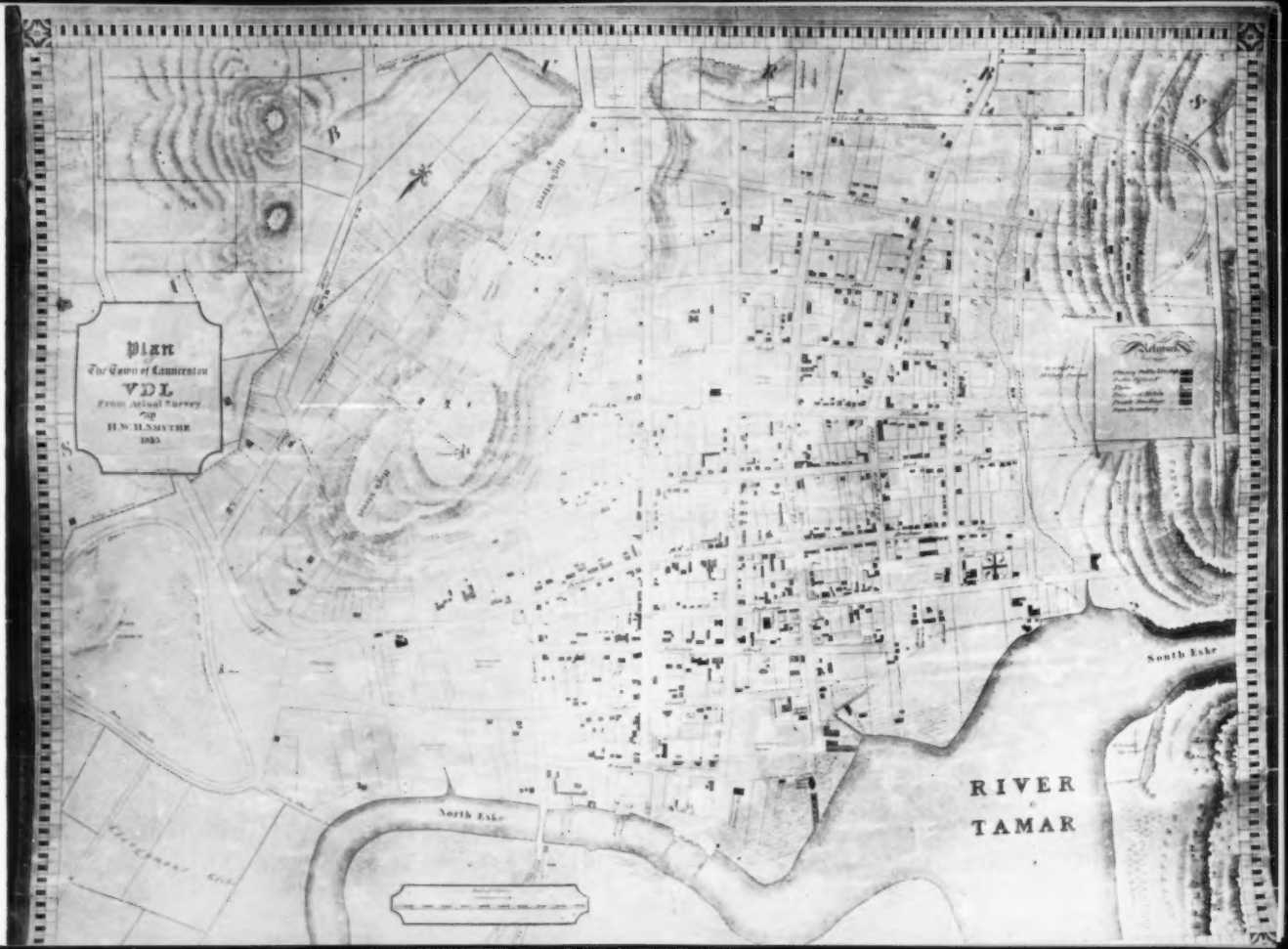
We have received a letter from Professor Ardito Desio, Leader of the Italian Expedition to K2 in 1954, and Director of the Geological Institute in the University of Milan, who, when recently in Gilgit, visited the grave of the explorer G. W. Hayward. Professor Desio placed a bunch of wild flowers on the grave, and has sent the photograph of it facing this page. Hayward received the Founder's Medal for 1870, for his impressive journey into eastern Turkestan in 1868/9; he penetrated into the dangerous and little-known country beyond the main Karakoram range as far as Kashgar, staying two months on the return journey at Yarkand which he describes as "the capital of Eastern Turkestan, so long deemed unapproachable and impracticable to Europeans." A full account of Hayward's experiences and researches, with a map, is to be found in the *Journal of the Royal Geographical Society*, Vol. **40** (1870) pp. 33–166. At the end of 1869 he wrote from Srinagar to Sir Roderick Murchison, then President of the Society, to say he was leaving immediately for Gilgit "in the hope of being able to penetrate to the Pamir Steppe and the source of the Oxus . . ." He reached Gilgit on July 7 and, on the 13th of the month, Yasin where he had reason to expect a friendly welcome from the local chief, Mir Wali Khan. Hayward was murdered at his camp at Darkhut, on his way from Yasin into Chitral, on July 17, and evidence taken at the time seems to prove that Mir Wali was responsible. There may have been some obscure political intrigue behind the murder; or the motive may simply have been robbery; or again, some fancied slight put upon Mir Wali by the explorer may have turned a supposed friend into an enemy. The fullest account of the circumstances is to be found in the *Proceedings* of the Society, Vol. **15** (1870/1), pp. 117–20, in a letter from Frederick Drew, British Agent in Kashmir, who had contrived the recovery of Hayward's body, and its burial at Gilgit. The Maharajah of Kashmir caused a stone to be placed over the grave in Gilgit cemetery, with an inscription drawn up by Sir Henry Rawlinson at the request of the Council of the Royal Geographical Society. Mir Wali took refuge with his relative, the ruler of Chitral, and George Hayward, who received the Founder's Medal posthumously, was mourned by many friends for, to quote Frederick Drew, "All who had had intercourse with him took pleasure in praising him for his courage and energy and for his pleasant manners."

METEOROLOGY IN THE ANTARCTIC

The Society's Library has received from the Meteorological Office of the Air Ministry a copy of Geophysical Memoir No. 94 'Meteorological Results of the *Balaena Expedition* 1946–47,' by H. H. Lamb.

Part I of this Memoir describes the general organization of the Balaena expedition and the meteorological arrangements, including instrumental gear. Certain aspects of the unknown geography of the Antarctic continent and its bearing upon the meteorological work are considered here and in the later sections. Part II present the meteorological results in terms of observation summaries and such lessons as can safely be learnt from them. The observations themselves are fully tabulated in the Appendices. An important part of the effort on this expedition was devoted to weather analysis over the Southern Ocean and to the experimental provision of a forecasting service for the remote Antarctic whaling grounds in the Indian Ocean and Australian sector. Part III consists of a description of the methods used and an appraisal of this forecasting experiment; the lessons of weather analysis in the regions covered have a wider interest as part of the general circulation of the atmosphere.

Sacred To the Memory of
G. W. HAYWARD
MEDALLIST OF THE ROYAL GEOGRAPHICAL SOCIETY
OF LONDON.
WHO WAS CRUELLY MURDERED
AT DARKUT
JULY 18TH 1870.
ON HIS JOURNEY TO EXPLORE
THE PAMIR STEPPE.
This Monument is erected
TO
A GALLANT OFFICER AND ACCOMPLISHED TRAVELLER
BY HIS HIGHNESS
THE MAHARAJAH OF KASHMEER
AT THE INSTANCE OF
THE ROYAL GEOGRAPHICAL SOCIETY OF LONDON.



Plan of Launceston

Reference on right :—
Places of Public worship
Public offices
Stores
Principal hotels
Private dwellings
Town boundary

It will be remembered that an article by H. H. Lamb and Commander Britton in the *Geographical Journal* for September 1955 discussed atmospheric circulation and weather variations in the Antarctic, and more recently *Nature* published a note, reprinted as a leaflet, by H. H. Lamb on "Antarctic atmospheric circulation" (*Nature*, **117** (1956) 1076–77).

SMYTHE'S FUNCTIONAL PLAN OF LAUNCESTON, TASMANIA, 1835

The following note on an interesting early town plan has been received from Mr. Peter Scott, of the Research School of Pacific Studies, Australian National University, Canberra. Mr. Scott was, until recently, on the staff of the University of Tasmania at Hobart.

"Functional ground plans of towns and cities are widely held to be cartographic developments of the present century. 'Probably one of the earliest,' writes Fead,[1] 'was that by Kröcher of 1913 showing Stettin,' though Dörries [2] cites an earlier map by Hanslik of Biala dated 1909. It is therefore worthy of record that there exists in Tasmania at least three copies of a functional 'Plan / of / The Town of Launceston / VDL / From Actual Survey / By / H. W. H. Smythe / 1835.' Of the three copies known to the writer, one is housed in the Launceston Public Library,[3] one badly stained copy in the Queen Victoria Museum at Launceston, and one torn incomplete copy in the Launceston Town Hall. The plan measures 25 × 20 inches, has a scale of about 1/4085, and was engraved by J. Carmichael of Sydney. Its distinctive feature is that the buildings are not merely listed in the legend, as is common with town plans of the period, but are classified by function and the five categories distinguished by a range of line shading and stippling (see plate facing). As such, Smythe's plan is of interest to the student not merely of urban geography in Tasmania but of cartography in general.[4]

"Of Smythe himself little has been discovered. The *Cornwall Chronicle* records that on 31 May 1831, Benjamin Smythe, Mrs. Smythe, Miss Smythe and Henry Smythe arrived in the *Britannia* from the Swan River settlement, where Benjamin Smythe had been employed as a surveyor and civil engineer. Later, Benjamin Smythe and H. W. H. Smythe announced themselves to be surveyors and architects, presumably prepared to practice privately. On 18 September 1831, Benjamin Smythe opened a Commercial and Mathematical Academy in Cameron Street, Launceston, where he taught, among other subjects, surveying and civil engineering. The Academy, however, was short-lived, for it had disappeared by 1834; yet, apparently undaunted by its failure, Benjamin Smythe opened the Mount Leslie Academy some four miles west of Launceston on 25 November 1837. Meanwhile, on 8 August 1835, the *Chronicle* carried the first advertisement of Smythe's plan, obtainable from his office in Brisbane Street. Beyond this, and the announcement in *The Courier* of William Henry Smythe's marriage, nothing has been gleaned. Neither Benjamin Smythe nor H. W. H. Smythe was ever employed by the Surveys Department in Hobart.

[1] Fead, M. I. 'Notes on the development of the cartographic representation of cities." *Geog. Rev.* **23** (1933) 441–456 (p. 454)

[2] Dörries, H. "Der gegenwärtige Stand der Stadtgeographie," *Pet. Mitt. Ergänzungscheft* N. 209 (1930) 310–325 (p. 323).

[3] Reproduced here by courtesy of the Launceston Public Library and the Visual Aids Branch of the Tasmanian Department of Education.

[4] The Smythe plan is not the only functional plan of an Australian town to be compiled at an early date. W. S. Jevons, the great English economist, compiled but did not publish a "Social Map of Goulburn, N. S. Wales, February 1859," in which he distinguished different types of residences and stores as well as churches and public buildings. His manuscript map is now in the Mitchell Library, Sydney, but some account of it is given by J. A. La Nauze in his 'Political Economy in Australia,' Melbourne Univ. Press, 1949 (p. 43).

"It seems unlikely that the Smythe plan is original in concept; it may well have been based on previous experience in England. If so, some functional plans of English towns may antedate 1835, though none is known to the writer nor to those whom he has consulted. Yet if such plans are found to be extant, this note will at least have served to stimulate enquiry; if not, it may well record the earliest functional ground plan known of an urban area."

THE ROCK RELIEF OF DARBAND NEAR RANYA

In a paper contributed to the *Journal* some years ago [1] I quoted a report by C. de Korab Bzezowski, a forest officer in the Ottoman service who visited the district in 1869, that he saw an ancient rock relief at the entrance to the defile of Darband-i Ramkan near Ranya. For reasons given in the paper I hazarded a suggestion that Brzezowski might have seen a relief elsewhere and that his memory had played him a trick when he came to publish his story twenty years later. My article immediately brought me, through Mr. Hinks, Secretary of the Society, a letter from Colonel F. R. Maunsell, who had passed this way in 1888, and who wrote as follows:

"As the quotation from Korab Brzezowski relates 'le défilé de Derbent devait servir de chemin le plus court entre Ninève et la Perse.' This must certainly have been the case as the route through the pass offers the easiest passage from Nineveh (Mosul) into Persia today. The ridge through which the river passes . . . runs north-west to south-east in a very sharply defined line, nearly perpendicular, of very hard blackish rock for some miles, separating the plain of Bitwên from that of Pizhdar next the frontier. The river defile is a short one, 400 or 500 yards. The road follows close to the right bank and there is little room between the stream and a perpendicular wall of rock for the road to pass, thus: (here follows a sketch). The rock is very hard and to prevent their chariots from side-slipping into the river the Assyrian warriors from Nineveh on their way to Persia cut a channel some two feet deep and eight feet wide for a couple of hundred yards in the defile to lessen this danger. When I noticed this I took it as a clear proof that the route was so used in ancient times, and certainly the modern Kurd would not have taken the trouble to cut such a channel in the hard rock. Then some forty feet above me on the face of the rock I noticed a cuneiform inscription cut in the rock in a space about four feet square where the rock had been smoothed for the purpose. I could not read this or copy it at such a height, I should have had to erect staging or ladders neither of which were procurable. Actually at the time an epidemic of cholera was raging in the district and the Kurds were dying in their tents; so to get any caravan through I had to hurry on. However I had time to notice the points I have referred to. I could see no actual relief, only the square tablet in the rock with inscriptions. If examined there may be one higher up, but it would show up on the hard rock and I do not think there is one."

I renewed my inquiries and commissioned some of my old friends in the Ranya district to make a systematic search at the point indicated by Maunsell. My persistence was rewarded in due course with a message from Isma'il Agha Ghafuri of Koi, Hama Agha of Ranya and Mamand Agha Chief of the Ako tribe saying that the *antika* had been found. I made an opportunity in the autumn of the same year, 1931, to visit Darband. Guided by them, and in spite of a painful attack of lumbago, I managed to climb up to the place, which was exactly as Maunsell had shown it in his sketch. There was a panel smoothed in the rock, measuring about 3 feet long and 2½ feet high; in the left half, as one looked at it, there was a slight swelling (one could hardly call it more) which might once have had a human figure in relief, but there was no sign of any cuneiform inscription. When I returned to the road below, knowing where to look, I could see the end of the panel with the swelling quite distinctly. C. J. E.

[1] Edmonds, C. J. "A third note on rock monuments in southern Kurdistan." *Geogr. J.* 77 (1931) 350–5.

A MAP OF WORLD AIR ROUTES

The map which appears here shows the present-day development of international air routes, as at January 1956. It will be seen, by comparison with previous maps,[1] that the general pattern of world passenger air routes has remained substantially unchanged for the last two decades: the main factor influencing their development is still the distribution of areas of dense population and of large cities, especially of those with more than half a million inhabitants. Thus, the most important routes are those lying along the Tokyo–Honolulu–Los Angeles–New York–London–Cairo–India line, with branches from India to the Far East and Australasia. A close network links Europe with Africa and North America with South America. Domestic routes across the North American continent and across the U.S.S.R. are very well developed. Long-range routes of interest to geographers are the "polar" routes introduced two years ago by S.A.S. Three flights a week link Copenhagen with Los Angeles via Sondre Stromfjord and Winnipeg. C.P.A. also operates a direct service once a week from Amsterdam to Vancouver (4897 miles) and on to Sydney via Honolulu, Canton, Nandi and Auckland. Although the general pattern has remained unchanged, there has been a tremendous increase in the number of services operated since the Second World War. The present position may be judged from the table of (return) service frequencies along the main trunk routes shown in the Appendix.

Figure 1

The present map is drawn on a new version of an octahedral gnomonic projection used for an air routes map in 1953.[2] This was devised to give the best possible representation of long inter-continental great circles and relationships. The particular form chosen here has been related as closely as possible to the present-day pattern of air routes. A regular octahedron of eight triangular faces and with sides sloping at an angle of 45° was chosen as the basis of the map (Fig. 1). This opens out as a star-shaped map covering the whole sphere (Fig. 2). This shape has been trimmed on the large map to remove the empty Antarctic regions, and parts of Australasia have been repeated to show the two-way approach to these areas from Europe. The usual mathematical properties would apply to any gnomonic projection plotted within this framework, i.e. azimuths would be correct from the centre of each face, and all great circles within each face would appear as straight lines. These lines would, however, change direction on crossing the edges between each pair of faces. There is only one point on each of the edges where great circles do not suffer such a change of direction. These "no-kink" points are marked on Figure 2.[3]

A good general map showing the continents in their true relationships to one another, and showing air routes adequately and continuously, can be obtained if a large number of focal air-ports fall at or near the centres of a polyhedral gnomonic, or at or near the no-kink points. The large map is an oblique gnomonic projection designed on this principle. For clarity, the edges between the faces have been omitted,

[1] See, for instance, air route maps in Philip atlases.

[2] Botley, F. V. "World Air Routes 1953." *The Aeroplane* **85** (27 November 1953), pp. 733–4. This map should be compared with the Mercator map in the Oxford Economic Atlas, which is of roughly contemporary routes.

[3] For a mathematical explanation of this point, see F. V. Botley. "An Octahedral Gnomonic Projection." *Emp. Sur. Rev.* **12** (1954), pp. 379–381.

but may be identified by laying a ruler between the appropriate corners of the projection. The projection-pole is at 75° 21′ N. 162° 36′ E. The 162° 36′ E. and 17° 24′ W. meridians divide the map into two halves, forming the edges of the middle pairs of faces, and the top edge, of Figure 2. The North and South Poles fall on these lines, and Dakar falls on the corners of the four central faces.

The scale above the map is based on the usual Tan × R formula, and shows the rapid increase of linear scale away from the centre of each face. The advantage of this form of the gnomic projection is in its representation of a number of very long

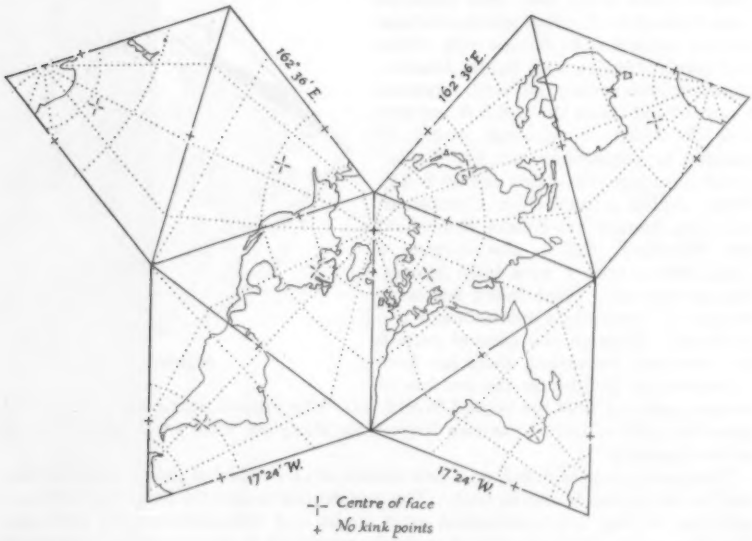


Figure 2

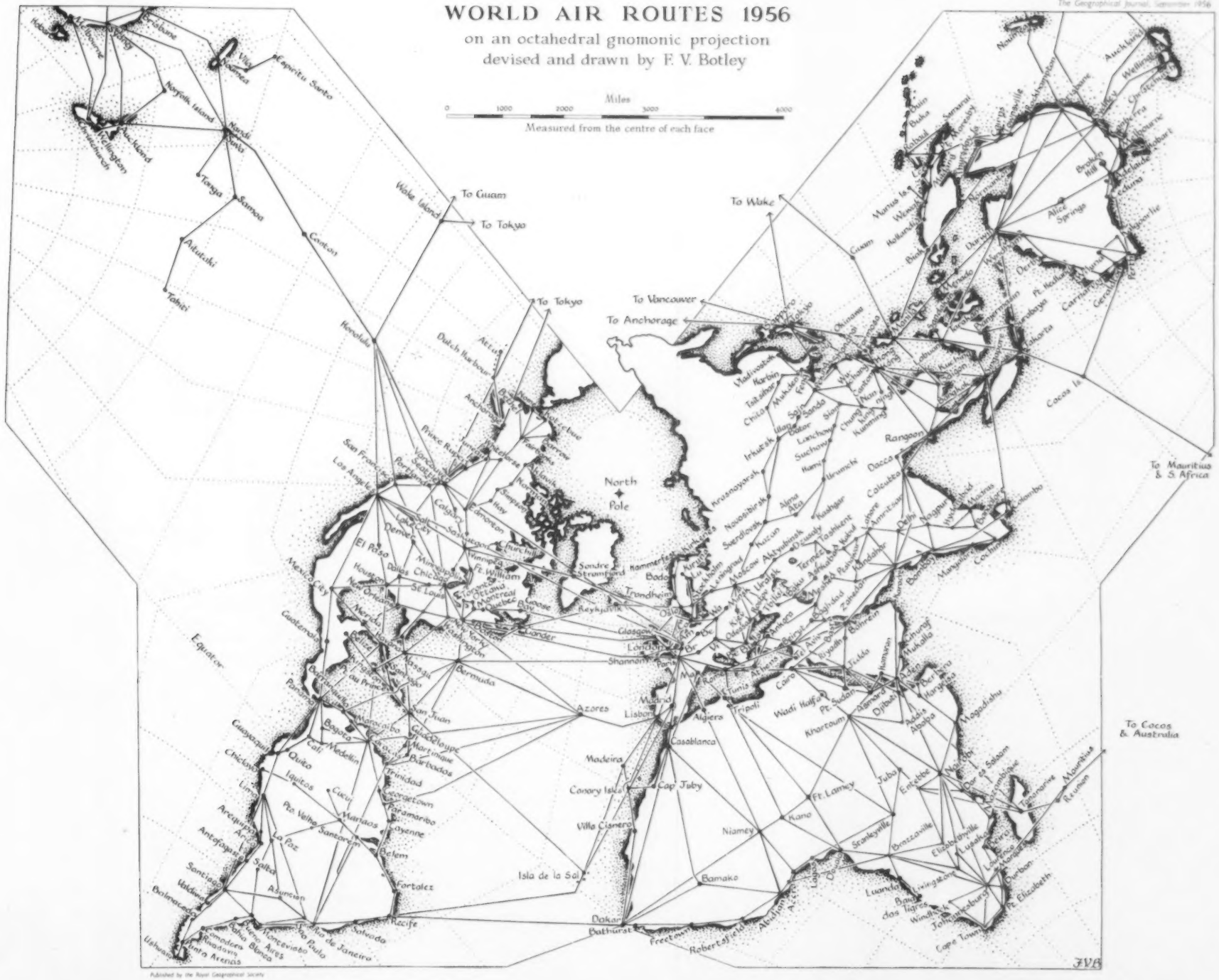
great circles which are of significance from the point of view of air routes. Thus, a straight line drawn on the map from Europe to Australia in either direction approximates very closely to the actual great circles on the globe. The Copenhagen–Los Angeles great circle, followed closely by the S.A.S. route, is practically a straight line on the map.

The northern circumpolar areas are also fairly well represented, and continental shapes compare quite favourably with those of many other projections, and particularly with those of other gnomonics.

WORLD AIR ROUTES 1956

on an octahedral gnomonic projection
devised and drawn by F. V. Botley

Miles
0 1000 2000 3000 4000
Measured from the centre of each face


To Guam
To Tokyo
Wake Island
Canton
Nandi
Suva
Tonga
Samoa
Aitutaki
Tahiti
Norfolk Island
Auckland
Wellington
Christchurch
Brisbane
Sydney
Melbourne
Hobart
Vila
Noumea
Espiritu Santo
To Tokyo
Honolulu
Dutch Harbour
Attu
Anchorage
Prince Rupert
Vancouver
Seattle
Portland
San Francisco
Los Angeles
Edmonton
Calgary
Winnipeg
Churchill
Ft. William
Toronto
Montreal
Gander
Goose Bay
Sondre Stromfjord
Reykjavik
Shannon
Glasgow
London
Amsterdam
Hamburg
Berlin
Prague
Vienna
Munich
Zurich
Geneva
Paris
Bordeaux
Marseilles
Rome
Milan
Nice
Ajaccio
Palma
Madrid
Lisbon
Azores
Bermuda
New York
Washington
Chicago
Detroit
Cleveland
Pittsburgh
Buffalo
Ottawa
Montreal
Minneapolis
St. Louis
Dallas
Houston
New Orleans
Mexico City
Guatemala
Belize
Merida
Havana
Nassau
Miami
Kansas City
Denver
El Paso
Albuquerque
Los Angeles
San Diego
Las Vegas
Salt Lake City
Seattle
Portland
Vancouver
Edmonton
Calgary
Regina

APPENDIX

PASSENGER AIR SERVICE FREQUENCIES PER WEEK ON MAIN INTER-CONTINENTAL LINES, JANUARY 1956

(These figures are based on the schedules shown in the A.B.C. World Airways Guide, published by Thomas Skinner.)

(*a*) Europe–North America	152
(*b*) Europe–Africa	164
(*c*) Europe–India and Ceylon	62
(*d*) Europe–South America	24
(*e*) North America–South America	77
(*f*) North America–Far East	37
(*g*) North America–Australasia	11
(*h*) Australasia–Asia	12

The following points should be noted:

(*a*) All these services are subject to seasonal fluctuations. In August 1955, for instance, North Atlantic services numbered 242.

(*b*) Of the Europe–Africa services, 66 pass through Cairo, 30 of these being part of routes going further east. Relatively short routes to Morocco number 26, and 24 flights pass through Dakar. Four Dakar and 15 Cairo services are operated by companies which are not permitted to accept passengers for the Europe–Africa section of their routes.

(*c*) Sixteen of the Europe–India services are flown by American companies who may not accept passengers for the Europe–India section of their routes.

(*d*) The withdrawal of the Comet on various B.O.A.C. routes in 1954 has led to the cancellation of this company's Europe–South American services.

(*e*) North–South American routes are supplemented by a large number of intermediate connecting routes via Central America and the West Indies.

(*f*) Ten of the 12 Australasia–Asia routes are, in fact, through routes from Europe. Only mainland-mainland routes are numbered here. There are numerous connecting routes via the Dutch East Indies, Manila, etc. F. V. B.

THE GEOGRAPHICAL HISTORY OF THE MESOPOTAMIAN PLAINS

In the *Geographical Journal*, March 1952, an article under the above heading was published by the late Dr. G. M. Lees and myself, with the general thesis that the area was not as stable as geographers and archaeologists tended to assume. The alluvium being brought down by the Tigris, Euphrates and Karun was not, we thought, causing a simple and gradual recession of the Persian Gulf to the South East; mountain building forces were still active in the Mesopotamian Plains, causing positive and negative local movements which were of importance in the study of the historical and prehistorical periods. This has been of considerable interest to archaeologists who have, in general, accepted its main conclusions.

In July 1953, at the IV International Meeting of Assyriology, Dr. C. J. Gadd called the attention of archaeologists to the article, which he thought ought not only to stimulate discussions, but should suggest more archaeological research of the area east and south east of Abu Shahrein (Eridu), hitherto quite neglected. He considered that "the remarkable conclusions of Lees and Falcon appear to be generally supported by physical investigators."

M. R. Ghirshman, in *Mémoires de la Mission de Susiane*, Vol. 36, 1954, refers to the interest of the paper, but it only reached him at the time his work was going to press.

In *Sumer*, the journal of Archaeology in 'Iraq, published by The Directorate-General of Antiquities, Baghdad, Vol. 11, 1955, No. 1, p. 5, is an account of a lecture by Professor M. E. L. Mallowan on "Recent Developments in Assyrian and Babylonian

Archaeology." Professor Mallowan, who quoted our *Geographical Journal* paper, has no doubt that the southern parts of the area, and even the Marshes, need further exploration, as it is possible, though by no means certain, that antiquities as old as those in the northern area may yet be found there. He comments that recent geological movements will have affected the position of the water table; archaeologists usually stop digging at the water table—perhaps too soon, as the water level may have risen in an area of subsidence. He suggests that the absence of the earliest cultures from the Lower Mesopotamian sites may be due to this, and encourages diggers to investigate a mound known to exist near Nahr-el-Umr.

In the same number of *Sumer* (p. 18), R. S. Solecki discusses river terraces, in an article on the Shanidar Cave of Northern Iraq. He suggests that variation in the heights of terraces of the Tigris River drainage system may indicate local tectonic movements, quoting our 1952 article. He refers to lack of evidence of glaciation in the Zagros Mountain chain of Northern Iraq, where terraces are found "reflecting climatic fluctuations, terraces which must have also been dependent upon episodic movements of the Zagros Mountains." He quotes R. F. Flint ('Glacial geology and the Pleistocene Epoch,' 1948, New York) as presenting data to show that the mountain areas of western Persia as well as the Anatolian Mountains were glaciated; but does not mention the note by the writer in the *Geographical Journal*, **107** (1946), p. 78, discussing a paper by A. Desio on glaciation in the Zagros Mountains. In this note I gave reasons to show that there is no evidence for a widespread former glaciation of the Zagros Mountains; glaciation appears to have been confined to local areas on the highest mountains.

In *Techniques et Civilisations*, Vol. 5, No. 1, 25, 1956 (St. Germain-en-Laye), R. de Mecquenem has used our article widely in writing "Notes sur la geographie de la Basse-Mesopotamie." In his paper, which includes a very inaccurate generalized geological map ("after Furon"),[1] some of our arguments do not appear to have been clearly understood. For instance, de Mecquenem has apparently misunderstood the argument about the great depth of water in the Khor Musa. We accepted that this is due to tidal scour but suggested that the tidal scour itself owes its origin to the slight subsidence which has caused the Mashur tidal embayment. Referring to the low terrace cliff separating the old and new cultivated alluvium near Basrah, de Mecquenem states that we thought this was due to uplift, whereas others have suggested that it is due to high spring tides. We actually stated that it implied *relative* uplift. Quite clearly if the high spring tides have formed the cliff by washing away the old cultivated alluvium, one still has to explain how the old alluvium was formerly cultivated in that position. Terraces can either be formed by a river which is cutting down owing to a lowering of its base level, which need not be a local phenomenon, or by a local elevation; it is, of course, very difficult to prove which, without careful study of a wide area. De Mecquenem repeats a misprint in Mallowan's article when referring to the rise of 6 metres in 4 kilometres of the old, presumed Sassanian, canal which was partially made over the Shaur anticline (Lees and Falcon, p. 33). The bed of this old canal was actually reported by us to rise 60 feet in 2½ miles. There is no absolute proof, of course, that the canal constructors had finished digging the canal at its high end, but it seems extremely improbable that the whole 60 feet can be due to this, particularly as the degree of excavation is about the same throughout. The bed of the second old canal, it will be recalled, is now about 12 feet above the water level of the water course which has succeeded it. De Mecquenem states that the Mongol invasion was more terrible than earth movements, re-cultivation of the Abbasid irrigation system south of Basrah, destroyed by the invaders, being impossible because of salt impregnation. This, however, ignores the most important query raised by the evidence, which is how land formerly cultivated comes to be below present-day high-water mark, when there

[1] An authoritative 1/1,000,000 geological map of S.W. Persia, by The British Petroleum Company, Limited, is being published at the XX International Geological Congress at Mexico in September of this year (1956).

are no signs of old bunds intended to keep out the sea. In referring to the evidence given by us for recent relative movements in the Dar-i-Khazineh area, de Mecquenem suggests that the Sassanian bridge-barrage at Shushtar, breached in Arab times, may have played a part in the latest erosion for which evidence was given, but his argument is not clear.

It is hoped that the many geological workers in the Mesopotamian Plains area will continue to collect evidence which has a bearing on the problems of history and prehistory. A study of river terraces will certainly be fruitful. A geographical/historical collaboration has recently obtained evidence to show that the Norfolk Broads are drowned peat-cuts of the Danish occupation period in Eastern England. If a relatively stable area like England can oscillate in the vertical plane to this extent, the possibilities in an unstable area like Mesopotamia are considerable. N. L. FALCON

SOVIET GEOGRAPHICAL SERIES IN THE SOCIETY'S LIBRARY

BULLETIN (IZVESTIA) OF THE ACADEMY OF SCIENCES OF THE U.S.S.R.: GEOGRAPHICAL SERIES 1956, No. 2 (March–April): Investigations carried out on board the *Vityaz* in the Pacific Ocean (1955), by V. G. Bogorov. The economic development of the Yakutsk S.S.R. in relation to the northern Asiatic part of the U.S.S.R., by S. V. Slavin. The process of accumulation of mud in connection with canals, by V. S. Kuprin. Development of slopes in the relief of the Central Russian elevation, by A. I. Spiridonov. Circulation of the atmosphere over China, by G. N. Vitvitskii. Characteristics of the meteorology of Northern Kazakhstan in 1955, by Y. I. Feld'man. The Alazansk–Agrichaisk valley in East Caucasus, by N. E. Astakhov and others. Indications of glaciation in the Tukuringra–Dzhagda range, by V. V. Nikolskaia. Basic problems of the economic regionalisation of the Soviet Union, by P. M. Alampiev. A projected regionalisation of China, by Lo Kai-Fu. Influence of the Tibetan highlands on the atmospheric circulation and weather of China, by E. Tu Chuzhen. Work of the Institute of geography of the Academy of sciences of the U.S.S.R. in 1955, by D. V. Kravchenko.

BULLETIN (IZVESTIA) OF THE ALL-UNION GEOGRAPHICAL SOCIETY OF THE U.S.S.R., vol. 88 (1956). No. 2 (March–April). Fundamentals of higher geographical education in the U.S.S.R., by R. L. Zolotnitskaia. Influence of natural factors on current, by A. M. Gavrilov. Hydrological studies in Bulgaria, by P. Penchev. Recent developments in the use of natural resources in Ceylon, by L. I. Bonifatieva. The "taiga" of the Karelian isthmus, by A. G. Isachenko. Woodlands of the west Siberian plain, by L. P. Shubaev. Valleys of the Sary-Arka (Central Kazakhstan) by G. T. Medoev. I. M. Krasheninnikov as paleogeographer and geomorphologist, by N. N. Sokolov. Z. Shirvani, the Azerbaijan geographer and traveller, by N. K. Keremov. Admiral Nagaev, a leading Russian hydrographer of the 18th century, by V. G. Goncharov. New Chinese maps and atlases, by I. K. Ovdenko. Reviews of 'Social geography of Europe,' by J. M. Houston, 'Geography of North America,' by Miller and Parkins, 'Regional geography of Anglo-America,' by White and Foscue, 'Europe,' by Valkenburg and Held.

NOTES

A recent circular from the METEOROLOGICAL OFFICE, AIR MINISTRY, draws attention to the fact that the Office's weather reports are available to the public, and full particulars of cost and circulation may be obtained from the Director at Dunstable, Bedfordshire. The reports are: "The Daily Weather Report," which includes weather maps for the previous day and for early on the day of issue; "The Monthly Summary," which contains notes on the weather of the past month; and "The Monthly Weather Report," issued about two months in arrear, which is a comprehensive publication consisting of over 16 pages of tables, summaries and analyses of observations at over 400 stations.

* * *

In his presidential address to the MANCHESTER GEOGRAPHICAL SOCIETY on June 26, Mr. L. M. Angus-Butterworth dealt with recent developments in the Society's activities and its future plans. The study circle meetings had proved very successful, and a field study of the Lymm area is in progress. The *Journal*, now edited by Mr. Geoffrey North of the Department of Geography at the University, is to be issued regularly each year, and the Society's collections are being rearranged so that full use may be made of them.

* * *

Two international bibliographies of importance to geographers have recently been issued. The BIBLIOGRAPHIE GÉOGRAPHIQUE INTERNATIONALE includes the publications of three years, 1951–3, in one volume of 1000 pages. The editors of the BIBLIOGRAPHIE CARTOGRAPHIQUE INTERNATIONALE, Mlle. M. Foncin and Mme. F. Sommer, are well up-to-date with the volume for 1954. Both publications, which should receive more support in Great Britain, are published under the auspices of the International Geographical Union and with the support of UNESCO and the Centre National de la Recherche Scientifique, Paris. Details of the cost of these and earlier volumes can be obtained from the office of the Society.

* * *

HUNTING TECHNICAL SERVICES LTD., of Boreham Wood, Herts, have compiled a brochure to illustrate the application of air photography to agricultural, soil, forestry, geological and ecological research. The booklet entitled, "Ninety-two million more mouths to feed," includes air photographs with interpretations on transparent overlays and examples of soil and land use maps.

* * *

To mark the completion of ten years' publication of *Weather* the ROYAL METEOROLOGICAL SOCIETY offers a prize of 40 guineas for an essay of about 5000 words in English under the title "The place of meteorology in liberal education." Entries must be received at the Society's address, 49, Cromwell Road, London, S.W.7, by 31 December 1956. The prizewinning essay will become the Society's property and may be printed in *Weather* or in any other suitable journal. Additional prizes may be awarded if entries of high enough standard are received. Competitors may state that they wish to enter for the first prize only: for such additional prizes particular consideration may be given to entries from those under 25 years of age. No prize will be awarded unless an entry of sufficient high standard is received.

* * *

CORRESPONDENCE

Standards of Geographical Knowledge

During this summer I have helped interview candidates for the posts of surveyor and assistant surveyor in the Falkland Islands Dependencies. Seventeen of the candidates, from eight universities, were newly graduated geographers who had just heard that they had achieved second-class honours degrees, or whose results were not yet out but whose professors expected them to attain second-class honours. Of these seventeen, seven were able to tell me why map projections are necessary and five were able to name a map projection; some of the five named several projections and all mentioned Mercator. Of the five familiar with the name of Mercator's projection two "rather thought" it would be unsuitable for use in the Antarctic and two didn't know.

W. D. C. Wiggins

Directorate of Colonial Surveys,
Tolworth, Surbiton, Surrey,
2 July 1956

'Himalayan Barbary'

May I make some comments on Professor von Fürer-Haimendorf's book 'Himalayan Barbary' which was reviewed in the *Journal* of March 1956. One can have nothing but admiration for his detailed study and patient work devoted to the life and customs of the frontier tribes, and for his success as a peacemaker among the clans. In the field of geography and exploration, however, the author does less than justice to his predecessors. Throughout the book wherever this aspect is discussed the emphasis is on the previously unknown and unexplored nature of the country. It is true that the upper valleys of the Khru, Kamla, and Subansiri were unknown. They are still unknown today. On p. xi of the Introduction it is said that between long. 93° and 97° E. the frontier is undefined and much of the country through which it is presumed to pass is unsurveyed. This is not so. The McMahon Line was never ratified, but the *de facto* southern boundary of Tibet (and China) was surveyed throughout (though not everywhere in great detail) by the different expeditions and explorations on the NE. frontier of India in 1911–12–13, from Bhutan to the India–China–Burma tri-junction.

On pp. 234–5 reference is made to the explorations of Kingdon-Ward and Ludlow on the Tibetan side. The exploration was done by Bailey and Morshead in 1913, but no mention whatever is made of them. They visited the last Tibetan village on each of the rivers that break through the main range and then join to form the Subansiri. The survey they made then was used by Kingdon-Ward and Ludlow more than twenty years later. There is also no mention of the visits to the Apa Tanis made by Nevill when Political Officer, Balipara Frontier Tract.

The map at p. 10 shows only drainage and villages, and many of the latter are incorrectly sited. The drainage is a reproduction on a smaller scale of the Miri Mission survey of 1911–12 with a small addition showing the Kiyi River and the headwaters of the Panior, which is the only area where the author broke new ground. Elsewhere he visited a comparatively small part of the country covered by the Mission. It is a pity that no routes are included in the map, and that in such mountainous country there is no attempt to show relief.

Turning from criticism to comment, the repercussions of the Miri Mission's conflict at Tali after thirty-three years make interesting reading to the few members of the Mission who are still alive. It is probable that no one at that time was aware of the full extent of the Naga porters' misdemeanours (p. 203); possibly these have

been exaggerated with the passage of time. One can however appreciate the exasperation of the author at having his road barred as a result of events a generation earlier. I conclude by thanking Professor von Fürer-Haimendorf for this book.

CLINTON LEWIS

10, *Gainsborough Gardens, N.W.3*
24 *May* 1956

'EAST OF EVEREST'

I have read Sir Edmund Hillary's book 'East of Everest' (*London, Hodder and Stoughton*, 1956, 21*s*), and of his first discovery of the Barun Valley. The fact is that the Barun Valley with its glacier was first discovered and photographed from the air by the Houston Mount Everest Expedition, 1933. May I quote the following extract from the text to which I take strong exception as being quite untrue "Very early in our trip it became quite clear that the map was completely inaccurate. We found vast glaciers and mountain ranges where nothing was indicated. Enormous valleys drained out through precipitous gorges, but all the map showed were gentle pastures. Obviously the surveyors who produced the map had never been anywhere near the country and had sketched things in with fertile imaginations."

The map so thoroughly condemned is clearly the R.G.S. map "The southern face and region south of Everest, from photographs of the Mount Everest Flight, 1933," scale 1 : 50,000, and though it is "completely inaccurate" the sketch-map on page 51 of the book has been copied from it, including the values of the spot heights, which were computed from the photographs. The only alteration is a shortening of the Barun glacier. An examination of Sir Edmund Hillary's narrative discloses that the heights of all features climbed, or mentioned in the book, have been taken from this map, and it is obvious from the description of the country in the text that the map was of great assistance to the expedition in finding their way about the terrain, though this is not acknowledged. Certain it is that there are no "gentle pastures" shown anywhere on the R.G.S. Everest map. The blank spaces could not be filled in as they were "dead ground" in the photographs.

In these circumstances it will be appreciated that after all the effort and laborious work in the construction of the map, I regard this sweeping and quite unjustified condemnation as being "completely inaccurate," and "sketched in from fertile imaginations."

HENRY F. MILNE

Green Hedges, Potter Heigham,
Gt. Yarmouth, Norfolk,
14 *July* 1956

OBITUARY

THOMAS DUNCAN BOURDILLON

Tom Bourdillon was one of the outstanding mountaineers of his generation. His achievements on the Chamonix Aiguilles shortly after the war played a considerable part in initiating that remarkable regeneration of British mountaineering in the Alps, which has enabled climbers from this country, for the first time for many years, to compete with the new standards of performance set by their Continental colleagues. His success in this field was due not only to his technical excellence as a rock climber, but even more to his determination and his power of single-minded yet imaginative concentration upon the problems he tackled. In this way he was splendidly equipped for the varied and vital roles he played both in the climbing of Everest and in the preparation for it. His climb with Evans from the South Col to the South Summit was as remarkable as any achieved on the mountain.

The fame he won on Everest did nothing to quench his enthusiasm for high-grade Alpine mountaineering. For his holiday this summer he had, I believe, planned several climbs more ambitious than any he had attempted before. But for all his zest

and drive, he was a thoroughly sound mountaineer. He had a strong sense of responsibility and did not believe in taking unjustifiable risks or climbing beyond his capacity. This makes it the harder to account for the accident which caused his death, while engaged upon a relatively easy training climb.

He was a most delightful companion. The searching intimacy of expedition life discovered in him no trace of malice, arrogance or affectation. I remember him best for his warmth and sympathy, for his sincerity, for the imaginative intelligence which emerged from his shy, reticent manner, for his quick anger at injustice done to others, for his gentleness, emphasized by contrast with his great physical strength, for his humour and, above all, for his inflexible loyalty. These characteristics were combined in a personality of rare quality and charm. ERIC SHIPTON

ALEXANDER HAMILTON RICE, A.M., M.D.

Dr. Hamilton Rice, who died on 23 July 1956, at the age of eighty, was a distinguished traveller, an authority on exploratory survey, and Gold Medallist and generous benefactor of the Royal Geographical Society. He and his first wife made the first and largest contribution to the fund raised at the centenary of the Society in 1930 for the new lecture hall and building. His last gift was a copy of the rare volume of charts, "The Mariners Mirrour," 1588, which he presented to commemorate the coronation of Her Majesty Queen Elizabeth II. Dr. Rice joined the Society in 1901, and was a Vice-President from 1930 to 1933.

Hamilton Rice, born at Boston, Mass., in 1875, always maintained close relations with Britain. When receiving the Patron's Medal of the Society in 1914, he remarked: "I have also read in the Press of my being a foreigner, but I do not consider myself as such. A son of New England and a true son of England, I feel as much at home in London as in Boston." He was educated at Harvard and afterwards studied medicine, taking his M.D. in 1904. By that time he had already begun his long series of journeys in South America upon which his distinction as an explorer was based. To equip himself for this career, he received instruction in exploratory surveying from Mr. E. A. Reeves at Savile Row, taking the Society's diploma in survey in 1910. He was interested in obtaining rapid and accurate observations with compact instruments, a subject in which Reeves had established a reputation. Hamilton Rice had tables computed and published to facilitate the use of Reeves' prismatic astrolabe for observations for time and longitude, a method which he used successfully in his expedition of 1924–5. In the 1914–18 war he was first a surgeon attached to the American hospital at Neuilly, but was later commissioned in the Navy and eventually became director of the navigation school at Newport, Rhode Island.

Dr. Rice's area of exploration was the north-western Amazon basin, and from 1907 onwards he examined and mapped the hitherto little-known rivers; in the course of his work he investigated the Casiquiare Canal, the natural waterway linking the Orinoco and the Amazon, and carried out research into the natural history and medical geography of the region. His last expedition in 1924–5 was to the easterly tributaries of the Rio Negro—the Rio Branco, Uraricuera and Parima. On this he made use of the hydroplane for reconnaissance, and was the first to take a short-wave wireless into the field. The narratives and maps resulting from his journeys were published in the *Geographical Journal*, the papers on the last expedition being later translated into French and Spanish. He had also written on air photography in geographical exploration. Dr. Rice received not only the Patron's Medal of this Society, but numerous honours from geographical societies in America and in Europe. In 1934 he was made a Chevalier of the Legion of Honour. G. R. CRONE

COMMANDER G. MURRAY LEVICK, R.N.

The death of Surgeon-Commander G. Murray Levick, founder of the British Schools Exploring Society, was reported in *The Times* of 1 June 1956, and a full

account given of a long, varied and distinguished career. Commander Murray Levick accompanied Scott to the Antarctic in 1910 as medical officer and zoologist, and his studies of penguins were well known. He served with distinction in both world wars, and in the years between he was, in the course of his medical career, more and more concerned with problems of maintaining physical fitness and with rehabilitation after illness or injury; his position at one period as medical director of the Heritage Craft Schools indicates that his interest extended to those who were permanently disabled as well as to the more fortunate whose injuries were only temporary and curable. Commander Murray Levick's well-known enthusiasm for the training of boys found expression in his work for the Lucas Tooth Boys Training Fund and on the committee of the National Cadet Training Fund, and culminated in the founding of the British Schools Exploring Society in 1932. When the Royal Geographical Society awarded the Back Grant to Commander Murray Levick in 1942, the President, Sir George Clerk, described him as "convinced of the value of inculcating the habit of self-reliance in young men, and at the same time encouraging the love of adventure"—a tribute which would be endorsed by the 800 or more former members of parties sent out by the British Schools Exploring Society. He was married in 1918 to Miss Audrey Beeton who has always ably supported him in all his aims and activities, and has herself played a leading part in the Exploring Society's affairs for many years.

MALCOLM J. PROUDFOOT

The sudden death at Oxford on 21 November 1955, of Dr. Malcolm J. Proudfoot came as a tragic shock to his many friends in Britain, the U.S.A. and Europe. He had visited Britain and Europe nearly every year since the war and his warm-hearted friendship had contributed much to the understanding of common problems.

Although as a child he had lived some years in Vienna and after graduation had studied in Berlin as an Alexander von Humbolt Fellow, he was particularly associated with Chicago and its area. He was trained at the University of Chicago and wrote a number of papers on various aspects of its urban geography.

His career had been varied. Early work on the staff of the Tennessee Valley Authority directing projects concerned with land use and classification and with reservoirs was followed by service first as a professional geographer and then as an administrator in the Bureau of Census which published his monograph "Measurement of Geographic Area" as one of the reports of the 1940 Census of the U.S.A. During the war he served as a Lieutenant-Colonel on the headquarters staff of the Allied Supreme Command, where his special gifts and training were devoted to the handling of the immense problems of the millions of refugees and displaced persons and he played a major part in their repatriation. This work resulted in his receiving two decorations from the U.S. Army and one from each of four other Allied governments. It also led him to devote intense research on the subject, over a number of years, culminating in a volume, 'European Refugees 1939–1952,' whose proofs he was correcting when he died.

He joined the staff of Northwestern University in 1947 as Associate Professor of Geography and there resumed his early interests in the problems of metropolitan areas and large cities on which he wrote many published papers as well as devoting his gifts to teaching and to inspiring keen research students in this and other fields. His initiative was responsible for the formation of the Northwestern University Center for Metropolitan Studies, of which he was Chairman and which attracted the support of business men interested in encouraging the postgraduate study of Urban Geography.

At the time of his death he was working as a Guggenheim Fellow at Oxford and London on a study of immigration into Britain. His many friends in this country will miss an enthusiastic, good-humoured colleague and their sympathies go out to his widow, Mary, and her three young sons. Mrs. Proudfoot is continuing her historical and constitutional research work, and teaching at Oxford. E. C. WILLATTS

MEETINGS: SESSION 1955–56

Meeting of 28 May 1956. The President in the Chair

Elections to Fellowship: Major W. Ellery Anderson, M.B.E., M.C.; Robert A. H. Coombes; Trevor C. Cornea; William Cowley; Jack G. Crossley, M.A.; Akinyele Fadase; Crosby I. W. Fox; Joseph Freedman; Peter McC. Gibbs; Nubar S. Gulbenkian; Rev. David F. L. Harris; Major Phillip James, M.B.E.; Rev. Robert O. Latham, M.A.B.D.; Squadron Leader Douglas Leckie; W. A. E. Lodge; Maung Min Lwin; Bernard Millen; J. Holmes Miller; Alexander Moore; Maurice O. Newton; O'Brien, The Hon. Mrs. Rose; Geoffrey Orrell; Colonel Alfred J. Page, T.D., D.L.; Mrs. Barbara Gambier-Parry; John G. Pike; John G. J. Pratt, M.A.; Rev. Albert Rogers; Mrs. C. Thompson-Schwab, B.A.; Lieutenant-Colonel Edward P. W. Stebbing; Mrs. Ena Stone; Mrs. Beatrice Stuart; Leslie N. Stuffins; Rev. Alexander Tee; John R. Tippett; Rev. Dr. N. G. John Vasu; Kingsley J. A. Watkins; Richard B. Wharldall, D.S.M.; Jack R. Wilding, B.SC.; Richard J. Williams

Election to Associate Membership: William W. Budden

Paper: Trans-Antarctic Reconnaissance. By Dr. Vivian Fuchs

Meeting of 4 June 1956. Professor L. Dudley Stamp in the Chair

Paper: Towns of Central and East Africa. By Robert Steel

Meeting of 11 June 1956. Mr. Leonard Brooks in the Chair

Films: Mount Wrangel Expedition. Colour films with commentary by Professor S. A. Korff

ANNUAL GENERAL MEETING, 18 June 1956. The PRESIDENT, General Sir JAMES MARSHALL-CORNWALL, in the Chair

The HON. SECRETARY, Dr. Edward Hindle, read the Minutes of the Annual General Meeting held on 20 June 1955, and these were confirmed and signed by the President.

The PRESIDENT then delivered his Presidential Address which is printed at pages 289–93.

The PRESIDENT: And now we proceed to the presentation of the Medals and Awards which the Society grants annually. I much regret that our Honorary President, Her Royal Highness the Duchess of Kent, is not here, as last year, to hand the awards to the recipients.

The *Patron's Medal* this year is awarded to John Giaever, of the Norwegian Polar Institute, Oslo, for his leadership of the first international expedition to the Antarctic, the Norwegian/British/Swedish expedition to Dronning Maud Land 1949–52. This was an expedition with which we and the Scott Polar Research Institute were closely associated. As its scientific results now show, it is outstanding among scientific expeditions to the Antarctic. But Captain Giaever's activities have not been confined to the Antarctic. For many years, before and since the War, he has assisted in the organization of many important Norwegian research expeditions to Svalbard and to Greenland and other parts of the Arctic.

It is a great disappointment to us that Captain Giaever, because of his preoccupations with yet another Norwegian Antarctic expedition, cannot be present in person to receive this medal and I am accordingly asking Herr Knut Thommessen, Councillor of the Norwegian Embassy, to receive it on his behalf.

Herr KNUT THOMMESSEN received the medal and the President continued:

From the Polar regions we turn to the Himalaya and to Charles Evans, who has been awarded our *Founder's Medal* this year for his contributions to Himalayan exploration and for his outstanding leadership of last year's expedition, which climbed to within reach of the summit of the world's third highest mountain, Kangchenjunga.

In the last six years, Charles Evans has been on no less than six expeditions to the Himalaya. In 1954 he was deputy leader of the New Zealand Alpine Club's Himalayan expedition, and the year before that he was the first man, with Tom Bourdillon, to reach the south summit of Everest. Charles Evans has achieved distinction as an explorer not only in the mountaineer's but in the geographer's sense, and his survey activities in the Himalaya will fill in many blanks in the map.

Mr. CHARLES EVANS: Mr. President, My Lords, Ladies and Gentlemen,—I regard it as a very great honour indeed to receive this award, an honour which I share in particular with the members of the Kangchenjunga Expedition. In common with every Himalayan climber in recent years I owe a huge debt to the Royal Geographical Society for its support, support which has been both friendly and generous, especially from the permanent staff in this building. It gives me the greatest pleasure to receive the Founder's Medal.

The PRESIDENT: Turning to the Awards, the *Murchison Grant* this year is won by Dr. Alice Garnett of Sheffield University. Dr. Garnett is well known for her important contributions to physical geography and climatology. She has in addition rendered many years of great service to the cause of geographical education as the Honorary Secretary of the Geographical Association.

Dr. ALICE GARNETT: Mr. President—I am deeply conscious of the honour the Society has conferred upon me in making this award. As you have said, Sir, it is perhaps the most coveted award, and I ask you to convey to the Council my warm appreciation of this honour. You have been kind enough to refer to both the Geographical Association and my own contributions to the subject. May I first say how happy I am that you made reference to the Association, for in so doing you honour a child of this Society. We are proud, as an Association, to maintain such close and friendly links with the parent Society, and you honour, Sir, through me, on this occasion, a very valiant band of teachers of geography representative of every category of educational institution, from universities to preparatory schools. Looking back over some thirty years of academic life I find it a little difficult to single out names with which this honour should be associated in connection with my own work; there are so many. But there is one name more than any other which should be associated with this award. I refer to one of the great pioneers who was battling on behalf of our subject more than fifty years ago, and through the early decades of this century—that brilliant teacher Professor Lionel Lyde. He was no physical geographer, and I somehow think that his way of thought in the subject would now be regarded as outmoded; and his text-books, classics as they were in those earlier years, are now hardly read. But the spirit and inspiration of his teaching still lives on, and those of us who were privileged to have studied under him will never forget that quite remarkable "pugnacious" eloquence that was his alone. It gives me great pleasure to feel that in the early years of the second half of this century, through me, on this occasion, this Society can revive the memory of, and pay tribute to, the inspiration of a quite remarkable pioneer teacher of our subject.

The PRESIDENT: The *Mrs. Patrick Ness Award* goes this year to Mr. Robert Dovers of the Australian National Antarctic Research Expedition. He was in charge of the survey party which completed the first map of Heard Island. In 1954, he was in charge at Mawson, the Australian mainland Antarctic base, from which he made many fine sledging journeys for mapping purposes. The scope and activity of Australian exploration in the Antarctic of recent years have been most remarkable. In this, Mr. Dovers has played an important part and it is a great pleasure to present this award to Commander Dovers, Mr. Robert Dovers' brother, requesting him to convey with it our heartiest congratulations.

Commander W. DOVERS: Mr. President, My Lords, Ladies and Gentlemen,—On my brother's behalf I wish to thank the Council and the Society for this award and to say how disappointed my brother is that he could not be present himself. My brother is a keen geographer and has always been interested in this type of work.

Like Mr. Charles Evans he appreciates that the award is in recognition of the work done by his small team as well as his own individual work. As you possibly know Australia is now making a continuous contribution to Antarctic research and hopes to maintain both the island stations and the mainland base at Mawson for some years to come. Both my brother and I are keen supporters of the Commonwealth ideal and it gives us great pleasure to realize that the activities of the smaller countries are watched closely by this great Society. I know that work of this nature is carried out without thought of reward but recognition such as is shown by this award to my brother serves as a great encouragement to the smaller research teams throughout the Commonwealth.

The PRESIDENT: Our Society has always been a centre of study in the history of cartography and exploration. Mr. Skelton's many important, and attractively illustrated, books and articles on this subject, as well as his reorganization of the Map Room at the British Museum, have contributed greatly to making known in this country and abroad, famous British treasures of cartography, and the history and the men connected with them. For these contributions, Mr. Skelton, Superintendent of the Map Room of the British Museum, gains this year's *Gill Memorial*.

Mr. R. A. SKELTON: Mr. President, My Lords, Ladies and Gentlemen,—I am deeply grateful to the Council of the Society for this award. It is an honour which is encouraging because wholly unexpected. I am uncomfortably aware that it has been earned by a relatively small achievement in original work. My work is mainly done in the service of two institutions which may be described as clearing houses for geographical studies. One of these is the national library in the British Museum; the other a publishing society of modest pretensions but of respectable seniority and very respectable parentage, since it was founded one hundred years ago by a group of Fellows of this Society. Both the Hakluyt Society, to which I have just referred, and the Map Room of the British Museum have derived strength from their long and close association with the Royal Geographical Society through the connection of their officers with it. Both my colleagues and myself, in the Map Room of the Museum, enjoy valuable contact with Mr. Crone and his staff in the Map Room and Library of the Society. Personal links of this kind can do much for scholarship. They keep open the communications between institutions which serve the same cause in the same fields of study. I am confident that in the future, as in the present and the past, geographers will continue to find themselves at home in the Map Room of the British Museum, particularly in those fields of historical geography and the history of geographical science, to which, as has been said, the Royal Geographical Society has given long and honourable service.

The PRESIDENT: Among the most important of British expeditions to the Arctic, and closely associated like its predecessors with the Royal Navy, was the British North Greenland Expedition of 1952–54. Commander Simpson, the leader, received the Founder's Medal last year. Now it is the turn of Mr. R. A. Hamilton, senior scientist of the expedition, who receives the *Back Grant*, traditionally associated with Polar exploration, for his contributions to Arctic meteorology and for his leadership of the scientific work.

Mr. R. A. HAMILTON: Mr. President, My Lords, Ladies and Gentlemen,—I am very honoured in receiving this award, particularly as I am a mere physicist and did not even take geography in the School Certificate! It illustrates, however, the ever widening aspect both of geography and of the vision of the Royal Geographical Society. For the day is past when an explorer made a rapid traverse of a country by means of compass and sextant: instead, expeditions carry out more intensive research over a limited area. There is, therefore, a tendency for expeditions to be larger than in the past, so that all the scientists can carry on their work in a small area and make use of the transport available to take them there. But that does not mean that the work of the surveyor is any less valuable than it used to be; it is just as necessary, but it must be more detailed and accurate. The meteorologist wants to know his altitude accur-

ately, the geophysicist his latitude and longitude, the biologist, the geologist, indeed any scientist who collects, must be able to pin-point on a map the position from which he collected his specimens. If there is one thing which has been driven into my mind as a result of our expedition, it has been that the surveyor and his map is still of primary importance. In thanking the Society for this award, may I also thank it for all the help it has given to the scientists of the expedition?

The PRESIDENT: Mr. Oates's archaeological surveys in Northern 'Iraq, for which he has been awarded this year's *Cuthbert Peek Grant*, are the sequel to earlier work carried out by one of our Gold Medallists, the late Sir Aurel Stein. Preliminary reports of this were published in our *Journal* but much is still unpublished and Mr. Oates has been engaged, under the British Academy, in checking and adding to this work in the field. In so doing, he has made important additions to our knowledge of Roman frontier topography and communications. Mr. Oates's work is by no means finished and you may remember that the Cuthbert Peek Grant is especially for the encouragement of future exploration. Mr. Oates is still in 'Iraq, and another Fellow of Trinity College, Cambridge, Professor Patrick Duff, who was to have received the award on his behalf has not been able to come, after all.

The PRESIDENT then appointed Mr. Charles Swithinbank and the Rev. J. B. Macmillan to act as scrutineers of the ballot for Council and Officers for the ensuing year. The HON. TREASURER (Mr. Leonard Brooks) made some general observations on the accounts. The Annual Report with the balance sheet was then unanimously adopted. It was announced that the scrutineers had reported that the candidates proposed for the Council and as Officers for the ensuing year had been elected, and the meeting terminated.

THE ANNUAL DINNER

The Annual Dinner of the Society was held at the Dorchester Hotel, Park Lane, on 18 June 1956. General Sir James Marshall-Cornwall (President of the Society) and Lady Marshall-Cornwall received the company, which included among the guests of the Society General Sir Gerald Templer, Chief of the Imperial General Staff, Lady Templer and Miss Jane Templer, Sir George Clark, President of the British Academy and Provost of Oriel College, Oxford, and Mr. Charles Evans, F.R.C.S., recipient of the Society's Founder's Medal for 1956.

Before the company of 190 sat down to dine,

The PRESIDENT said: Today I caused the following telegram to be sent to Her Majesty The Queen:

> "President, Council and Fellows of the Royal Geographical Society, assembled today for Annual General Meeting, presentation of Royal Medals and Annual Dinner, present to Your Majesty their loyal greetings and humble duty."

I have just received from Her Majesty at Windsor the following telegram:

> "Please convey to the Council of the Royal Geographical Society my sincere thanks for the loyal greetings which as its Patron I very much appreciate.
>
> ELIZABETH REGINA."

After the Loyal Toasts, General Sir GERALD TEMPLER said: Mr. President, My Lords, Ladies and Gentlemen,—The Society has done me a signal honour in asking me to propose the toast of "The Royal Geographical Society" at its Annual Dinner. I think I should say that I kicked like a mule when I received that request, but your Director and Secretary, with whom I had many dealings during the war, soon put an end to that business. And I would like to say as C.I.G.S. that I am very glad indeed to try, however ineffectively, to pay tribute this evening to the close association which has existed between the British Army and your learned and yet most human and friendly Society ever since your foundation.

When your great Society was founded in 1830 the scope for pioneer exploration was pretty well unlimited; scientific discovery, travel and exploration were high in men's minds after the long years of endurance and then of victory in the Napoleonic Wars. The interiors of Africa and Australia were unknown; the Arctic passages linking the Atlantic with the Pacific were undiscovered; Central Asia and the Far East a closed book to travellers; the great continent of Antarctica, discovered only a decade before the Society's foundation, had been touched at only one or two points. During the last one hundred-odd years all these previously undiscovered lands and seas have been added to the map. The Poles, North and South, have been reached; Everest has been climbed and now the last continent, Antarctica, is to be crossed by a British expedition. What a splendid part the Royal Geographical Society has played in all this! And it is characteristic of the British way of life that so much of the stimulus and active power behind those great achievements has come from a private Society whose members have been drawn from all walks of life, not merely the scientists and the geographers. And what untold romance is there! Perhaps romance is today not a subject which is much spoken about except in the rather narrow sense advertised so much on the hoardings of our great cities.

I think I was first fired with all this business when my father used to tell me when I was a very small boy the story of his mother's cousin, Robert O'Hara Burke, who perished in 1861 after crossing the arid heart of the continent of Australia in company with William John Wills. The expedition crossed the continent from Melbourne to the Gulf of Carpentaria, but ended in the death of the leaders. My father used to tell me they went "from Cooper's Creek to Carpentaria," and to me as a small boy it sounded like a line out of one of Adam Lindsay Gordon's poems. I am proud that a forbear of mine should have been awarded the Founder's Medal of this great Society. Again, a few months ago I stood at the source of the Nile where Speke stood in 1858 and pondered on all that had happened to the great river, and because of it, in the years between and what will happen, and because of it, in the years ahead, I found that a most overpowering moment.

Of course the first-fruit of all exploration then as now is the map. It is to the soldier, as to the geographer, the first essential of his equipment. It is a tribute to the military importance of the map and of geography that the Ordnance Survey should be so called, and that the heads of the great departments of land survey in this country should have been drawn from the Army. I am an infantryman and I have always taken a great interest in the matter of maps and their accuracy, largely because the gunners shoot off them (anyway sometimes) and as an infantryman it was always exciting to find out how accurate the map was. I understand that in general terms the modern function of exploration is to fill in the gaps in the broad picture painted by the early explorers, by mapping and by detailed investigations. Those are, so to speak, the material contributions of modern exploration. But there is another less tangible side of the opportunities exploration provides today; I mean for the development of the qualities of leadership, of initiative and courage. We in the Army continue to produce, I am glad to say, our quota in this regard—John Hunt and Charles Wylie on Everest and Streather of last year's Kangchenjunga ascent; also our contribution in men and equipment to the British North Greenland Expedition of 1952–54. Those are a few of the present-day soldiers following in the footsteps of many others over the last one hundred years or more. May they have many successors, and as worthy. I speak also for my sister services. But, please, is it too much to hope that some mountain, some desert, some river, some "Abominable Snowman" or his equivalent, may for ever remain unknown, undiscoverable, maybe even a chimera—like the lost continent of Atlantis or the sunken treasures in Tobermory bay! How dull this world will be when there is nothing left to conquer or discover or map, except the latest Espresso bar! However, doubtless by that time lots of people will be having fun in space suits.

Finally, I want to say, on behalf of the Army, that nothing could be more symbolic

of the close association and friendship between us than your continued choice as President of a most distinguished soldier who is also a geographer in his own right. Your Society has done so much to foster those qualities of initiative and leadership, especially among the youth of the nation, which we also strive for in the three fighting services of the Crown. This year no less than eighteen expeditions, sponsored by you among university undergraduates, are afoot. Their geographical range extends from the Arctic to Borneo, from Persia to Peru. May your great work long continue to flourish. Next year doubtless there will be many more expeditions, and I am glad, on behalf of the War Office, to be able to make my contribution now in hardware and human material, so to speak, to one of them, a journey to the Tibesti Mountains in 1957; and here it is, Mr. President, in the form of a letter authorizing the use of military transport. In this and in other ways the Royal Geographical Society whose toast, linked with the name of your President, General Sir James Marshall-Cornwall, I propose tonight, continues to foster the pioneer spirit which inspired its founders.

The PRESIDENT, in responding, said: General Templer, My Lords, Ladies and Gentlemen,—On this occasion a year ago we were celebrating the 125th Anniversary of the Society's foundation. As the good ship *R.G.S.* was launched, so to speak, from a naval dockyard and under the patronage of a sailor King, our guest of honour at last year's Dinner was, appropriately, the First Sea Lord. However, throughout our 126 years of fruitful activity we have been as closely, if not more closely, connected with the Army. Of my forty predecessors in the presidential chair only five were naval officers whereas ten were soldiers, beginning with our second President, General Sir George Murray, who had served as the Duke of Wellington's Quarter-Master General in the Peninsular War. Our present Council includes only two representatives of the senior service, whereas we have eight officers in or retired from the Regular Army, besides a distinguished officer of the Territorial Army. Therefore, it is meet and right that on this occasion our guest of honour should be the Chief of the Imperial General Staff. We are honoured, indeed we are very delighted, to have the C.I.G.S. with us this evening. Not only is he a distinguished soldier but he has proved himself to be an outstanding administrator. Before taking up his present pre-eminent position he was, as you know, responsible at a very critical juncture for restoring order and stable government at the time of the Communist infiltration into Malaya. In that country he was confronted with grave geographical difficulties. He overcame those difficulties in a masterly way and, if I may say so, largely because he possesses what I call a sense of geography. I wish to express the Society's thanks to Sir Gerald Templer for the kind words he said about us, and more particularly for the kind assistance which the War Office is giving the Society and which I have not even had time to read yet because the envelope was only handed to me just now. I anticipate that it means valuable and real assistance to a party of Cambridge graduates who propose to make an expedition in 1957 through the Sahara to central Tibesti. I requested the War Office to help them with vehicles, fuel and other assistance, which I am glad to think, through the kind offices of the C.I.G.S., has been granted.

The C.I.G.S. has referred to our traditional connection with the Army. He has mentioned the Napoleonic Wars. Well, our tradition does go back to the Napoleonic Wars because two of the Society's early Presidents, Sir George Murray and Sir Roderick Murchison, both Highlanders, took part in the Battle of Corunna in 1809. I, as a member of the Permanent Committee on Geographical Names, should, I suppose, have given that place its correct map name, La Coruña, especially as I see the Chairman of that Committee with his stern eye upon me for giving you the wrong name of a place on the map. However, Colonel Wheeler, there is nothing you and I can do about it. It is true that the Committee taught the Royal Geographical Society to spell Kangchenjunga the right way, but for the British Army La Coruña will always be Corunna.

Today is the anniversary of the Battle of Waterloo, that epic struggle in which Wellington finally defeated Napoleon. Wellington and Napoleon—two of the "great

captains" of history, masters of the art of war, both of whom were deeply imbued with a sense of geography. Sir John Fortescue, the historian of the British Army, wrote as follows in summing up the Duke of Wellington's military qualities: "He possessed one gift of remarkable value to a strategist, that of retaining the geography of a country clearly and accurately in his memory. His tactical eye for ground was not less remarkable." That is what I mean by a sense of geography, but it can only be acquired by deep study and long application, and the "great captains" did not neglect that deep study.

In June 1796, before he embarked for India, Wellington or, as he then was, Colonel Arthur Wesley—he did not change his name to Wellesley until two years later—Colonel the Honourable Arthur Wesley, commanding the 33rd Foot, bought for two guineas at a book shop in Bond Street Major James Rennell's 'Memoir of a Map of Hindustan,' at that time the standard work on the geography of India. Fellows of the R.G.S. will remember that Major James Rennell, the great Surveyor-General of Bengal, was one of those who laid the foundations of this Society. He was the great-great-grandfather of Lord Rennell, one of the Society's recent Presidents, now sitting on my left. Wellington was not the only "great captain" to appreciate the cartographic work of James Rennell. I find that on 5 April 1798, Napoleon wrote the following minute to his Minister of War in Paris: "General Bonaparte is informed that there exists in the War Ministry copies of Major Rennell's Map of Bengal and special Maps of the Ganges published by the English. He begs you will place them at his disposal. (Signed) Bonaparte." Napoleon was a real student of geography. When he left for Egypt a month after this request, in May 1798, he took with him in his luggage thirty-nine books on geography and travel, including three volumes of Captain Cook's *Voyages*.

I have always considered that William T. Sherman was the best General thrown up by the American Civil War but, of course, that is a matter of opinion, and there were other good Generals such as Grant, Lee and "Stonewall" Jackson; however, I find Captain Liddell-Hart agrees with me; therefore, I think I must be right. Anyway, it was Sherman's 200-mile march through Georgia, from Atlanta to the sea at Savannah, which finally caused the collapse of the Confederate Armies. Sherman was also a keen student of geography. He appreciated the value of it to a soldier. Here is an extract from a letter which he wrote to a friend twenty years before he made his famous march to the sea, when he was a twenty-four-year-old artillery subaltern stationed in South Carolina: "Every year I feel more and more in need of an atlas, because the knowledge of geography in its minutest details is essential to a true military education."

Besides being Waterloo Day this is the anniversary of another episode, more recent but less renowned, in the history of the British Army. On Tuesday, 18 June 1940—sixteen years ago—I happened to be in command of all the British troops remaining in France after the Dunkirk evacuation, which had been completed a fortnight earlier. We withdrew—that is the correct word, I believe—the last 200 miles through Normandy, from Rouen to Cherbourg, fighting a rearguard action against the 7th Panzer Division commanded by a German General of the name of Rommel. We succeeded in embarking over 30,000 men, including our first and only Armoured Division, which lived to fight another day, and we did not lose a single tank or gun. But Rommel's tanks were within 3 miles of the harbour when the last ship left at 4 p.m. The point is that our only casualties were two platoons of a Scottish Territorial Regiment forming part of the rearguard. They took a wrong turning in a village called Valognes; instead of taking the road north-west to Cherbourg they took the road due west, the result of which was that they bumped directly into Rommel's command post and were all wiped out, except for nine enterprising "Jocks" who succeeded in escaping and managed to cross the Channel in French fishing boats. Now the young officer in command of that detachment had made an elementary mistake in map-reading. One can do that easily and with impunity in peace time, but in war it

may have fatal consequences. So proficiency in geography and map-reading is essential to every soldier, whether he be a "great captain" or only a humble platoon commander. Now, Sir Gerald, I wish to thank you once more for your inspiring words to us and your good wishes. I can assure you, sir, that our Society looks forward to continuing in the future those happy and close relations which have always linked us to Her Majesty's Armed Forces.

The PRESIDENT, rising again, added: My Lords, Ladies and Gentlemen,—I am sorry to inflict myself upon you once more, but I have just had an opportunity of opening the letter which the C.I.G.S. handed to me. It is so charming of him that I would like to read an extract from the contents. It concerns the request I told you I had made to the War Office for assistance to an expedition to take place in 1957 in the Sahara. This is the answer which I have received from the Vice-C.I.G.S. under orders, of course, of the C.I.G.S.: "The Army would be glad to help this expedition, and we are prepared to allow three Land Rovers and their drivers to take part." I think that is absolutely magnificent. I cannot think of any better form of cooperation than that given to the Society by the Army tonight.

Sir RAYMOND PRIESTLEY: Mr. President, My Lords, Ladies and Gentlemen,—It is my privilege to propose the toast of "The Medallists and Guests." A Royal Geographical Society medal is, of course, an honour recognized throughout the world. The medals are awarded for efficiency and excellence of performance, and entirely without bias. One of our aims tonight is to wish long life and prosperity to the recipients of the awards this year. I share the feelings of our President and also, I gather, of the C.I.G.S. about the problem of the shrinking of the unknown in the world. Next year American scientists plan to launch the first unmanned satellite to circle in orbit about the earth. Whether or not mankind manages to reach Mars or Venus, I sometimes think, despite the prophecy of my old friend, the Astronomer Royal, which so disturbed the space travel fans, we may in the comparatively near future be developing a lunatic fringe of our own.

Tonight we are honouring Captain John Giaever, the leader of the first really international Antarctic expedition. In these days, when a splinter mentality seems to possess the nations of the earth, this really international effort has much more than ordinary significance. John Giaever, self-described as "an old crow superintending the activities of wise young owls," led his fellows with discretion, tolerance and skill. He has well earned the Patron's Medal even by the rather exacting standards of the second Elizabethan Age. In his regretted absence we wish him well.

This year's Founders' Medallist we have with us. Charles Evans, surgeon and scientist, who stands out both in quality and achievement among modern mountaineers. He numbers six expeditions to the Himalaya alone. To most men it would have been enough to stand as he did with Tom Bourdillon on the southern summit of Mount Everest. Evans, however, believes in piling Pelion on Ossa. Last year he returned to make possible, through his judgment, skill and expertise, the ascent of Kangchenjunga, the third highest mountain in the world, starker and more difficult and dangerous than Everest itself. Welshman as he is, he will not mind if we claim his achievement for the Commonwealth, and indeed for mankind. Evans has proved that he sets the goal above the reward, for when the expedition returned to accept the acclaim of the world he turned back to continue his quest for the unattained. We now wish him further heights to scale in the old field and greater heights in other walks of life.

It is our custom to combine with the Medallists in this toast our other guests. The guest of honour has already been dealt with, to some extent, by our President. I have seen a little of Malaya, both by air and by road, and therefore can appreciate the magnitude of the task the C.I.G.S. attempted there and form some faint idea of the greatness of his achievement in this last triumph of a fine military career. We can do no better than wish him peace while as C.I.G.S. he turns the Army inside out, for in every human institution there must be room for improvement. May he find, in the

Welfare State of Eden, fertile soil for crops of technological "dragon's teeth." For the rest, I spare their blushes, and only mention two more guests. Our President has, as his personal guest, Colonel Lord Middleton, Lord-Lieutenant of the East Riding of Yorkshire. As a Deputy Lieutenant of Warwickshire, in this particular season, when Tom Dollery has retired with disastrous results, I feel, in front of him, particularly small beer. As a polar explorer of days half-a-century removed, I welcome particularly the heir of a family which produced Sir Hugh Willoughby, who set out in 1555 to find the North-east Passage and perished with all his crew on the Murmansk coast. Sir George Clark, President of the British Academy, Provost of Oriel, is a synthesis of the best in the British academic world. I am not particularly known as a partisan of Oxford, especially in the sporting field. Indeed, I was once guilty of writing that the best that could be said of television was that it gave the whole world a chance to see an Oxford boat sink. But as an Honorary Fellow of Clare College, Cambridge, I can welcome an Honorary Fellow of Trinity as an elder brother, and the Provost of Oriel at least as a stepfather. Last year we had as the Society's guest the President of the Royal Society, Lord Adrian, a strictly Cambridge product. This year we rejoice to be able to greet the best of both academic worlds. I ask you to rise and drink to all our guests, a throng worthy of the examples I have cited in the time I am allowed.

Mr. CHARLES EVANS: Sir Raymond Priestley, Mr. President, My Lords, Ladies and Gentlemen,—It is a matter of distress to me that Captain John Giaever is not here tonight, partly on your account, but I must confess also on my own, because he and not I would have replied to this toast if he had been present. However, in his absence I have the opportunity to say how much I admire the qualities for which he has been awarded the Patron's Medal, and how I admire his achievement in leading in harmony men of several different nationalities.

When it comes to myself, Sir Raymond Priestley has given me a chance to explain, if I can, why a climber should appear at all in this rôle. For many years past there has been a tradition of very happy cooperation in Himalayan exploration between the Royal Geographical Society and the mountaineers. It is a tradition for which we are grateful, but one whose benefits I have come to look on as rather one-sided, one requiring explanation. There are two aspects to climbing: it is a sport, like tennis or Rugby football; it is also a form of exploring; and it is the exploratory side of climbing that gives us a claim to your sympathies. Even the most restricted specialist in climbing, the highly skilled rock-climber, is in his way an explorer. One recently took me up a climb in Wales where, after two or three hours of painstaking progress up a vertical face, I found myself on a small sloping ledge; I was expected to follow him over the smooth bulge of rock which cut off the view above my head; I can assure you from personal experience, that at that moment the one thing I had at heart was discovery, the discovery of something with which to hold on; and no one above, who had seen my groping hand appear over the edge, out of the abyss, would have doubted for a moment that somewhere below was a man whose whole being was devoted to the search for the hidden secrets of nature.

Climbers are sometimes, perhaps, a bit rough and ready in their geography, like the two Russian mountaineers who recently began a lecture on "Climbing in the Soviet Union" by saying, at Cambridge, that it was a great pleasure to be able to give a talk on Russian climbing at the University of Oxford. Often, we come back from what has seemed a highly successful expedition with little record of where we have been, with perhaps not even a sketch-map; sometimes we even deserve to be called "geographical renegades," a title suggested to me by hearing defined as medical renegades "those doctors who become known by engaging in pursuits other than medical, such as Dr. Livingstone, and Dr. Crippen."

But I think, and most of you will agree, that this comparative lack of interest in making a detailed record is strong evidence that the climber is a true explorer: for him, as for others, the map is less the reason for going to far places than the excuse.

A practitioner, as I hope you will let me call myself, in one small field of exploration, I should like to thank you, Sir Raymond, for the generous way in which you have proposed this toast, and you, ladies and gentlemen, for the cordial way in which you have received it.

Sir GEORGE CLARK: Mr. President, My Lords, Ladies and Gentlemen,—I have the very easy task of replying to the kind remarks that have been made about your guests whose health was drunk and thanking you for the delightful entertainment. I think, in fact, the reason why I am to speak at all is in order that you may see by the juxtaposition of your two guests, the Chief of the Imperial General Staff and myself, what a very wide variety of mankind is embraced among the admirers of your great Society, though there are some reasons to think that the heads of colleges in Oxford and Cambridge are not so very different from general officers as you might suppose. Some here probably remember a very remarkable man and traveller, the late Dr. Marret, who once said an extremely wise word on this subject. He was playing golf in a club match and found himself walking from tee to tee with a general officer who said: "I don't know much about Oxford colleges; do explain to me how you become the head of an Oxford college," and Dr. Marret replied: "In exactly the same way as you become a General—by survival."

In fact, geography has been a meeting place, a common ground, for the student and the man of action ever since the world began. It certainly was so in the first famous geographical discoveries at the end of the Middle Ages, and has been so in England since the time of Hakluyt and the beginning of the 'principal voyages of the English nation' with which the name of Willoughby, as you have been reminded, is associated. I am an historian and an association of ideas has a powerful effect on the mind. I am exercising my utmost self-control to stop beginning a lecture, and I accomplish this piece of self-mastery by reminding myself that my own Oxford College has a very particular place in this story because we boast of having educated Sir Walter Raleigh, whose name stands very high in the list both of men of action and of the thinkers; and not only Raleigh but a number of his associates, including Thomas Harriot, the mathematician and geographer who wrote the first good account of Virginia, and I have reason to know how enduring these traditions are in these ancient colleges. Only last week one of the youngest members of this institution wrote to me plausibly suggesting that the college ought to subscribe to his plan for spending, partly in the interests of science, the greater part of his vacation in Socotra. I may say I have had the opportunity of discussing this project with your Director and although the subscription is being paid, it is very moderate in quantity.

It would be entirely unnecessary for me to say anything about the long, important and growing associations between geographical studies and the Universities. There are in this room some of the most distinguished representatives of such associations, from Sir Raymond Priestley in his corner of the room to the Master of St. John's in his, and to others spread about all over it. The British Academy, which has been mentioned, is also in many ways associated with these studies, and it is through this that I have had opportunities of meeting your Director. He has given us much help and advice, in association with some of your Fellows, in regard to two important pieces of work: one the administration of the great benefaction of the late Sir Aurel Stein. The other is advising the Colonial Office in regard to archaeological and historical matters in the colonial territories, which often involve geographical knowledge. There must, indeed, be very few people who are concerned with studies in any serious manner who have not found reason to admire and appreciate the work which you have done. I feel highly honoured to have this opportunity to thank you, not only for this evening's entertainment, but for so much more. I can only repeat the words of Sir Gerald Templer: may the work of your Society long continue.

THE ROYAL GEOGRAPHICAL SOCIETY

KENSINGTON GORE, LONDON, S.W.7

FELLOWSHIP AND ASSOCIATE MEMBERSHIP

The object of the Society being the Promotion and Diffusion of Geographical Knowledge, it has always welcomed to its Fellowship those anxious to further this object by their interest and support, as well as those able to take a more active part in the work of discovery and exploration.

FELLOWSHIP

The Bye-Laws provide that a candidate for admission to the Fellowship of the Society must be proposed by a Fellow personally known to him and seconded by another Fellow. Further, that a candidate is not eligible until he (or she) is twenty-one years old, unless he holds a Commission in Her Majesty's Forces or he (or she) is a matriculated student of a University of the United Kingdom or the Self-Governing British Dominions. Proposal forms can be obtained on application to the Director and Secretary.

Every Fellow shall be required to pay on election *either* £4 as Entrance Fee and £4 as Annual Subscription for the current year and thereafter an Annual Subscription of £4 due on 1st January in each year; *or* a single compounding fee of £60.

The Entrance Fee and first Annual Subscription may be paid in four quarterly instalments of £2 each; *or* the Entrance Fee and first two Annual Subscriptions may be paid in four half-yearly instalments of £3 each. Thereafter the Annual Subscription may continue to be paid in four quarterly instalments of £1 each or two half-yearly instalments of £2 each respectively. Entrance Fee and Annual Subscription may be paid by instalments only where payment is made by Banker's Order. Half-yearly instalments shall be due on the 1st January and the 1st July; quarterly instalments shall be due on the 1st January, 1st April, 1st July and 1st October.

For Fellows who are under the age of 25 years on election the Entrance Fee shall be reduced from £4 to £2. The Entrance Fee and first Annual Subscription may be paid in four quarterly instalments of £1 10*s*. 0*d*. each *or* the Entrance Fee and first two Annual Subscriptions may be paid in four half-yearly instalments of £2 10*s*. 0*d*. each: thereafter payment may be by instalments as above. Entrance Fee and Annual Subscription may be paid by instalments only where payment is made by Banker's Order.

Fellows may compound for their Annual Subscriptions at any subsequent time by a payment of £60 less £2 for each Annual Subscription paid in excess of five with a minimum of £20 after 25 payments.

No Fellow shall be entitled to vote or to enjoy any privilege of the Society while in arrear.

ASSOCIATE MEMBERSHIP

The Bye-Laws covering the terms of Associate Membership provide that—

1. *A candidate must be not less than 17 and not more than 20 years of age. He (or she) must be recommended by a Fellow, University or School authority.*

2. *Subscription shall be £2 per annum without Entrance Fee.*

3. *On attaining the age of 21 Associate Members become eligible for Fellowship. The Entrance Fee of £2 shall be waived provided they have been Associate Members for 3 years. Otherwise Associate Membership shall cease at the age of 21.*

All subscriptions are payable in advance, on the 1st of January in each year.

PRIVILEGES OF FELLOWS AND ASSOCIATE MEMBERS

The privileges of a Fellow or Associate Member include admission (with one Friend) to all ordinary Meetings of the Society, and the use of the Society's House, Library and Map-room. Each Fellow is also entitled to receive a copy of *The Geographical Journal*. Associate Members have the choice of receiving either *The Geographical Journal* or *The Geographical Magazine*. Associate Members may not describe themselves as F.R.G.S. and have no vote at Annual or Special General Meetings.

A pamphlet giving details of the Society and a copy of the Charter and Bye-Laws will be sent on application to the Director and Secretary.

Made and printed in Great Britain
for the Royal Geographical Society
by William Clowes & Sons, Ltd., Beccles
Entered as second class mail matter (5 January 1898) in the
New York Post Office, N.Y.